AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

JULY 15, 1954

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Advanced Design for Bus Suspension System
Precision Operations on Power Steering Parts
Prospects for Small Industrial Gas Turbines
Higher Corvette Output by Improved Methods
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A CHILTON PUBLICATION

for want of a horse the smith was lost

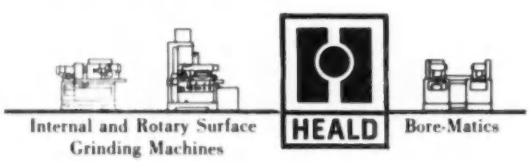
THE blacksmith shop was a busy place . . . when horsepower came "on the hoof". But when the first gasoline engine coughed and sputtered into life, the days of the village blacksmith were numbered.

That's progress. Spurred on by competition, it spells success for some things, obsolescence for others.

In today's highly competitive market the search for *new* and *better* methods of production is an urgent one. It's a problem that calls for fresh thinking and sound experience.

When it comes to precision finishing, we would like to show you how Heald engineering and the latest Heald equipment can help you build a better product at lower cost. New developments in automation, way-type and transfer Bore-Matics, interchangeable tooling and internal grinding methods may well be the answer to your particular problems.

Competition is wonderful when you're *ahead* of it. Our business is to keep you there. That's why IT PAYS TO COME TO HEALD.



Internal and Rotary Surface Grinding Machines

Bore-Matics

THE HEALD MACHINE COMPANY

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Offices in Chicago • Cleveland • Dayton
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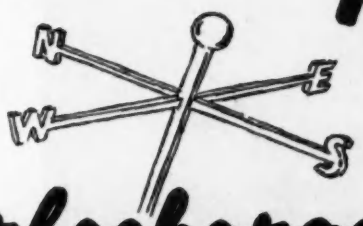
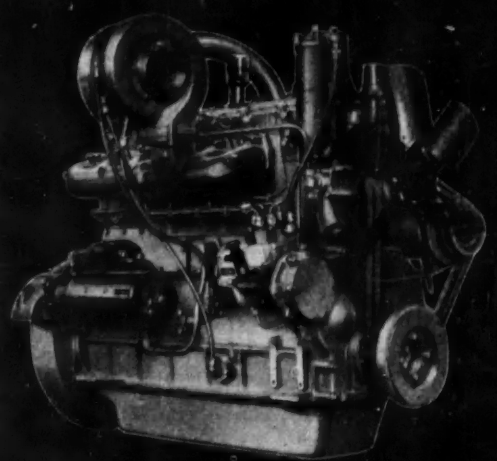
EVERYWHERE— THEY GO!



turbocharged WAUKESHA Diesels

with the

PAYLOAD POWER PLANT



135-DKBS TURBOCHARGED DIESEL—six cylinder, 4¼-in. x 5-in., 426 cu. in. displacement, maximum hp. 185 at 2800 rpm. Get Bulletin 1617.

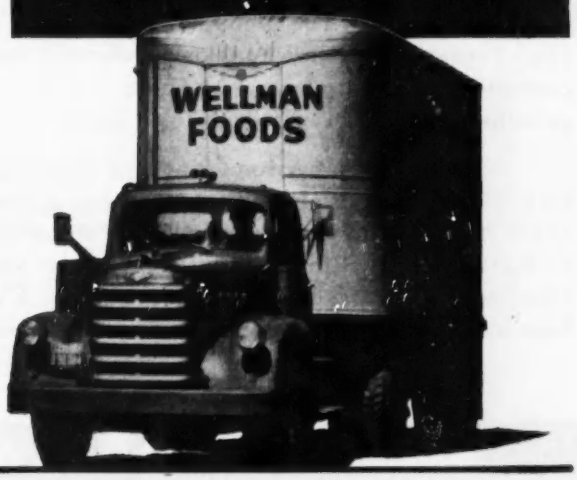
For greater power at lowest fuel cost—the Waukesha Turbo-supercharged 135-DKBS! It is a compact, powerful, heavy-duty, six-cylinder, four-cycle, full Diesel. The patented combustion chambers burn all standard "high-speed Diesel fuels" having cetane values of 45 or above. This powerful supercharged Diesel offers lively acceleration, clean burning, prompt starting, a tremendous reserve of power, and great overall economy.

The exhaust turbocharger system of supercharging affords a great increase in horsepower with a minimum of parasite load. Even without an intercooler the maximum power available from the Model 135-DKB Diesel Engine is increased from 147 hp. to 185 hp. at 2800 rpm. Without positive drive from the engine, the parasitic load decreases at part engine load, which improves overall fuel economy throughout the speed range.

Other advantages of the exhaust turbocharger are a relatively light and compact installation, flexibility in mounting, and the smoothing out of the exhaust impulses by the turbocharger turbine. Contributing to the Waukesha turbocharged Diesel's complete reliability and long-lived, trouble-free operation are time-tested and war-proved features developed in over 45 years of study and experience in building heavy-duty industrial-type internal combustion engines.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.

NEW YORK • TULSA • LOS ANGELES



THIS WAUKESHA 135-DKBS powered high-speed over-the-highway rig operates in the Northern California-Oregon region.

247

Mattison Grinder beats old time (15 hours) by 12 hours

The picture above shows a punch and die grinding operation on a Mattison High-Powered Precision Surface Grinder at Lyon Metal Products, Incorporated. Previous time on a converted planer-grinder was 15 hours — now with a Mattison Grinder equipped with special fixture, grinding time has been reduced to 3 hours.

Mattison Grinders are proving profitable investments in plants where "time out" for reconditioning is a vital factor in meeting production schedules. Surfaces are reconditioned and edges sharpened in a minimum of time, eliminating costly delays and holdup of production. Many manufacturers installing the Mattison Grinder for reconditioning dies find many other uses for it in grinding flat surfaces where accuracy and fine finish are required. For complete information on the Mattison High-Powered Precision Surface Grinder, send for free copy of our latest circular.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

A CHILTON MAGAZINE AI PUBLISHED SEMI-MONTHLY

AUTOMOTIVE INDUSTRIES

JULY 15, 1954 VOL. III, NO. 2

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• You can't see any difference in any of these springs. But a difference is there! Because one is an Accurate Spring . . . *designed* and *engineered* for the job it does. It is held to close tolerances and guaranteed to provide top performance.

Accurate Spring Manufacturing Company approaches spring problems with a background of skill, experience . . . and imagination. Something that makes a real difference when devising a new way to make you a better spring at lower cost.

To solve that spring problem . . . and to start a pleasant association with a company whose business is built upon a quality product and fine service . . . contact Accurate Spring today. Ask for a copy of the Accurate Handbook of Technical Data on Springs too. It's full of information on how to specify springs.

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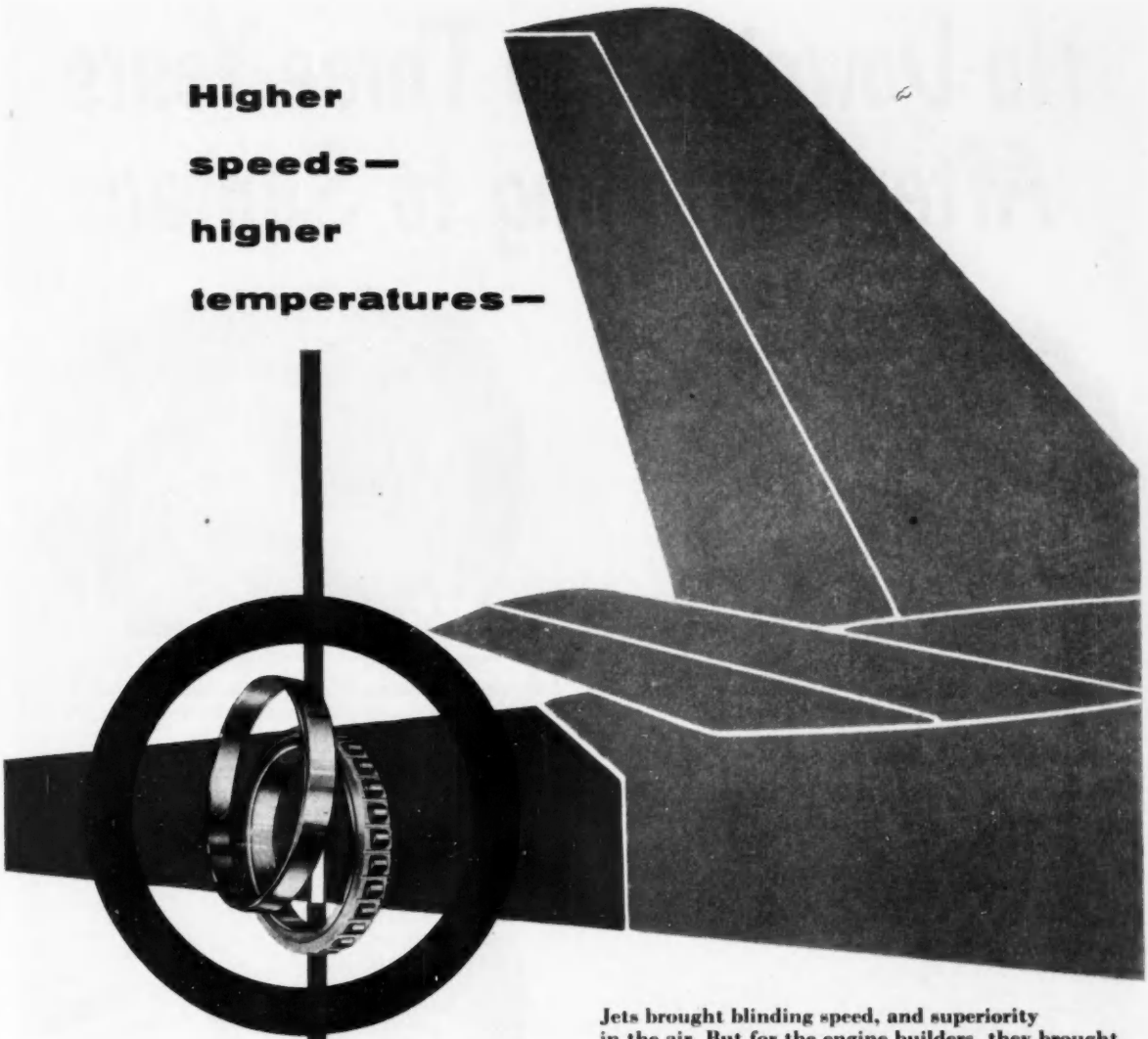
Higher speeds— higher temperatures—



HYATT BEARINGS!

Jets brought blinding speed, and superiority in the air. But for the engine builders, they brought problems. With higher speeds came higher operating temperatures, and engine parts, especially bearings, had to be designed to withstand destructive heat. So designers turned to Hyatt. With unexcelled research and development facilities, modern production equipment, and years of experience, Hyatt was a logical choice. Hyatt know-how assured highest quality in mass production, and since 1944 Hyatt has been a major supplier of jet bearings. When design requirements are beyond the capabilities of ordinary bearings, always call on Hyatt.

Partial list of aircraft equipped with turbo-prop and turbo-jet engines using Hyatt Bearings:

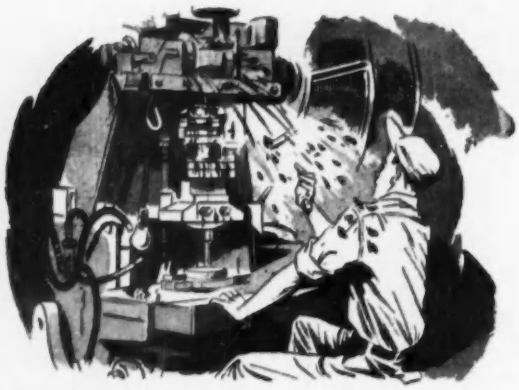
Bell X-5 Research Monoplane
Boeing XB-47C Air Force Medium Bomber
Consolidated—Vultee Model 7002 (XF-92A)
Consolidated—Vultee Turboliner
Douglas XA2D-1 "Skyshark" Navy Attack Bomber
Grumman F9F "Panther" Navy Fighter Plane
Lockheed F-80C "Shooting Star" Fighter Plane
Lockheed F-94A & B Air Force Fighter Plane
Lockheed TO-1 U.S. Navy Version of the F-80G For Use as Jet Trainer
Martin P4M-1 Long Range Navy Patrol Bomber
Martin B-57A U.S. Air Force Version of the English Electric Canberra Medium Bomber
North American AJ-1 "Savage" Navy Carrier Attack and Search Airplane
Northrop F-89A All Weather Fighter Plane
Northrop YRB-49A "Flying Wing" Heavy Bomber
Republic F84F "Thunderjet" Fighter Plane

HYATT

STRAIGHT BARREL TAPER

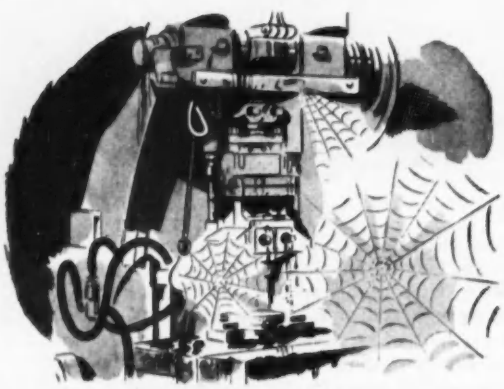
HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, N. J.

No Downtime in Three Years After Switching to Suntac



Metalworking firm was using heavy-duty stamping presses of an older type. Bearings were wearing excessively. Oil leaked constantly—on machines, floor and operators.

Lubricant loss was so severe that bearings frequently became so hot the machines had to be shut down until the bearings cooled. This cut sharply into production.



Bearings had to be replaced on an average of once every eight months. Repairs usually took four weeks, and during this time the machines as well as the floor space were completely non-productive.

Manufacturer switched to SUNTAC because it's especially compounded to cut leakage. No breakdown now for over three years. Oil consumption reduced 50%. Also using SUNTAC to lubricate other equipment.

Do you have machines with worn, leaky bearings? Or are you losing oil through excessive throw-off from rotating or sliding parts? SUNTAC is especially compounded to reduce drip, splash and squeezeout. Its greater adhesiveness makes it cling firmly to the parts it lubricates. Get all the facts about SUNTAC from your Sun Oil representative. Or write Dept. AA-7.

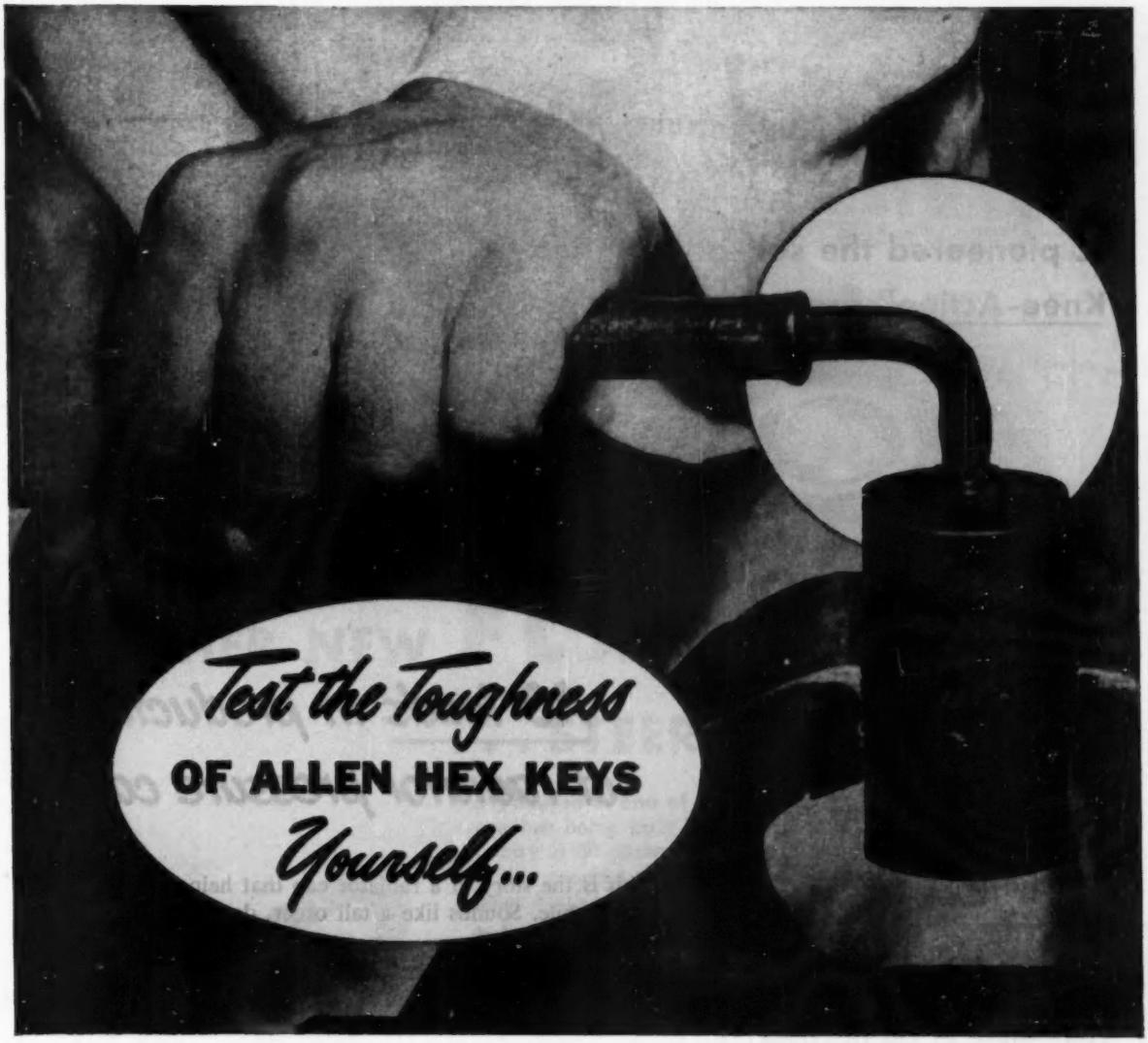
INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Refiners of famous High-Test Blue Sunoco Gasoline



Unretouched photo

To prove to yourself how tough Allen heat treated keys really are, slip a section of pipe over an Allen hex key that has already tightened a socket set screw to the maximum recommended. Twist the key around its axis a full 90° — IT STILL WON'T BREAK! When the Allenoy steel key finally does shear, the break will be smooth. No splinters, no jagged edges to cause injury.

• • •

For the toughest drive key made, get Allen Hex Keys, size-marked for convenience in all sizes above 1/16".

When ordering through your local industrial distributor, specify genuine Allen Hex Keys.

The strongest team in fastening.

ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut, U.S.A.

ALLEN HEAD

First and Foremost

AC pioneered the self-adjusting "Knee-Action" pressure cap . . .

AC leads in production of radiator pressure caps

This is the story of a radiator cap that helped to restyle an automobile. Sounds like a tall order, doesn't it?

The first radiator pressure cap was introduced in 1936 to increase cooling efficiency, prevent evaporation and surge losses. It did these things well so long as the seat was level and the loose gasket didn't get lost during servicing.

Then, in 1940, AC pioneered the self-adjusting "Knee-Action" pressure cap with integral gasket. Both problems were solved; solutions quickly adopted by the industry.

With pressure cooling an entirely new kind of automotive styling became practical, making it possible to lower the radiator and give the car low, sleek, modern lines.

AC pressure caps are on more than 70% of today's cars. This is another example of the creative engineering and volume production which have made AC foremost in its field.

If you need help in solving a tough problem, why not call or write one of the AC offices below:

FLINT—1300 North Dort Hy.
CHICAGO—Insurance Center Bldg.
DETROIT—General Motors Bldg.

For More than Twenty Years Every Make of Car Has Used One or More AC Products

• ADAPTERS (Drive) • AIR CLEANERS • AIR CLEANERS AND SILENCERS (Combination) • AMMETERS • BREATHERS (Crankcase) • CAPS (Radiator Pressure) • FLEXIBLE SHAFT ASSEMBLIES • FUEL PUMPS • FUEL AND VACUUM PUMPS (Combination) • FUEL FILTERS & STRAINERS • GASOLINE STRAINERS • GAUGES—AIR (Pressure) • GAUGES—GASOLINE • GAUGES—OIL (Pressure) • GAUGES—TEMPERATURE (Water, Oil) • OIL FILTERS (Lube) • PANELS (Instrument) • SPARK PLUGS • SPEEDOMETERS • TACHOMETERS • TERMINALS (Ignition Wire) • VALVES (Crankcase Ventilation)

AC QUALITY PRODUCTS

AC SPARK PLUG DIVISION GENERAL MOTORS CORPORATION

Flxible-Twin Model FT2-40
for Chicago Transit Authority

ANOTHER NEW FLXIBLE ... STEERED BY ROSS

▶ **Pictured is one of 400** Flxible-Twin propane-powered transit coaches being built for Chicago Transit Authority. Seating capacity is 50 passengers, overall length 40 feet. The entire fleet of 400 coaches will be equipped with Ross Steering—*as have all other Flxible coaches since 1936.*

▶ **Exclusive steering specialists** since 1906, Ross provides a gear for every steering need—*manual* or *power*.

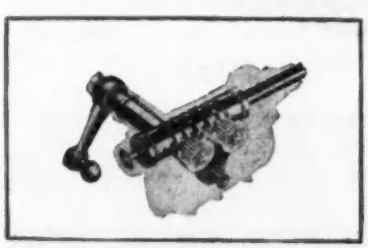
Ross Cam & Lever *manual* steering has long been noted for maximum *ease* and *stability* in just the *right* combination . . . sturdy, rugged construction . . . minimum wear . . . simplicity and speed in any needed adjustment.

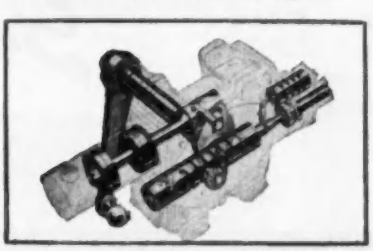
Active in *power* steering since 1942, Ross is currently producing—for a wide variety of vehicles—both *integral* and *linkage* types that are among the *simplest*, *surest*, most *economical* power units yet developed.

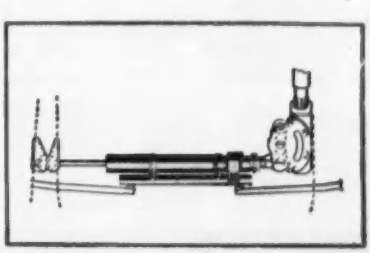
▶ **We invite** discussion of *any* steering problem.

ROSS GEAR AND TOOL COMPANY · LAFAYETTE, INDIANA

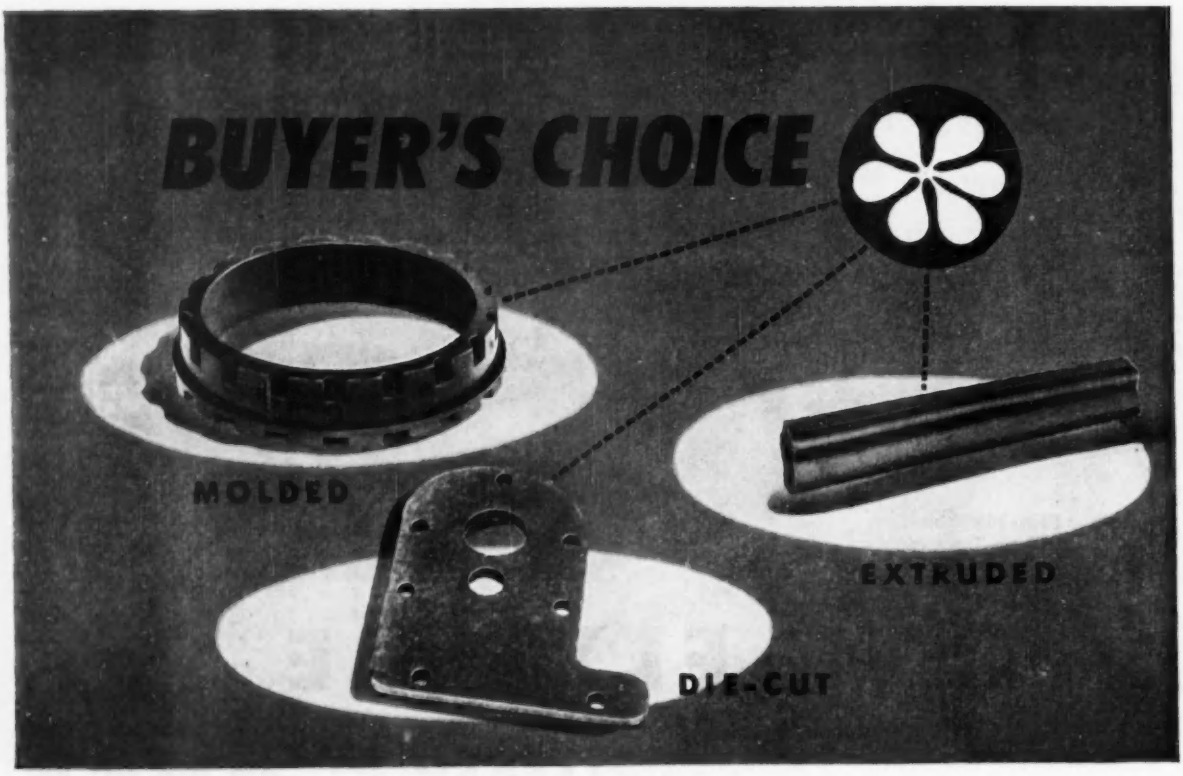
Ross STEERING







CAM & LEVER MANUAL...HYDRAPOWER INTEGRAL...HYDRAPOWER LINKAGE



*ACADIA SYNTHETIC RUBBER PARTS ARE MADE ALL 3 WAYS!

With Acadia you have a *choice!* Not only molded rubber . . . not only molded and die-cut . . . not only extruded rubber . . . but rubber parts any way you require! Better yet, Acadia uses whatever method the requirements of the job and you dictate is the *best* way to do it.

Acadia is especially sensitive to your specifications. We will process synthetic components for oil-resistance — good aging properties — resistance to heat — any characteristic you're seeking, or a combination of characteristics. Acadia parts are cut, molded or extruded to all required shapes, sizes and types, with almost unlimited applications.

Also, we offer Acadia SILICONE Rubber, molded or extruded for gaskets, seals, "O" rings, washers, sheets, cut-parts and packings. This is the rubber that will stay resilient at 100° *below* zero, or 500° above!

There's an Acadia Sales Engineer near you to serve you. Write us today, and we'll put him in touch with you immediately.

ACADIA Synthetic PRODUCTS

DIVISION OF WESTERN FELT WORKS

4021-4139 W. Ogden Ave., Chicago 23, Illinois
Branch Offices in Principal Cities

MANUFACTURERS AND CUTTERS OF WOOL FELT

Courtesy Eclipse Lawn Mower Company, Prophetstown, Illinois

HOW TO MAKE A BETTER ASSEMBLY CHEAPER

RIVETING THE "HY-POWER" WAY

Lawn mower blades must be fastened to the reel tightly and *in perfect alignment* to assure product performance and acceptance. That's why the Eclipse Lawn Mower Company, Prophetstown, Illinois (as well as many other leading lawn mower manufacturers), uses Hannifin "Hy-Power" cold-squeeze riveting.

What's your assembly problem?

If you haven't investigated fast, safe, clean cold-squeeze riveting, perhaps you should! Parts are drawn tightly together under quiet, relentless hydraulic pressure. Rivet shanks expand to fill the hole completely, making the tightest joint possible; heads are formed to any shape and every rivet is identical. And, with this modern push-button-controlled method, operators need no special training to apply it.

"Hy-Power" Riveters are available, standard or special, for portable use or in fixed mountings, as shown. Power source is the exclusive Hannifin "Hy-Power" Hydraulic Pressure Generator—so dependable that the first model, made nearly 20 years ago, is still in daily use.

ONE RIVET AT A TIME OR SEVERAL!

Hannifin "Hy-Power" Riveting is ideal for multiple installations where several "Hy-Power" Cylinders—available in capacities from 7½ to 100 tons—advance, rivet and retract in unison. Your Hannifin representative is anxious to help you select exactly the "Hy-Power" installation you need. Why not call him in? Meanwhile, get the full story by writing for Bulletin 150.

HANNIFIN

Hannifin Corporation, 1143 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

Multiple spindle automatic builders do not deny the importance of good frame design. As early as 1920 Cone's revolutionary frame was substantial evidence that Cone did something about it.

For some time there has been discussion concerning the relative merits of the use of 100% carbide tooling on multiple spindle bar automatics. There has been very little information made available about successful carbide application to this type of machine by its builders or by carbide suppliers. But Cone is doing something about it.

The Conomatic Carbide Development program is accumulating much helpful information for "automatic" users through test runs under production conditions. The illustration is an example of such information applied to an actual production run. Full data is available.

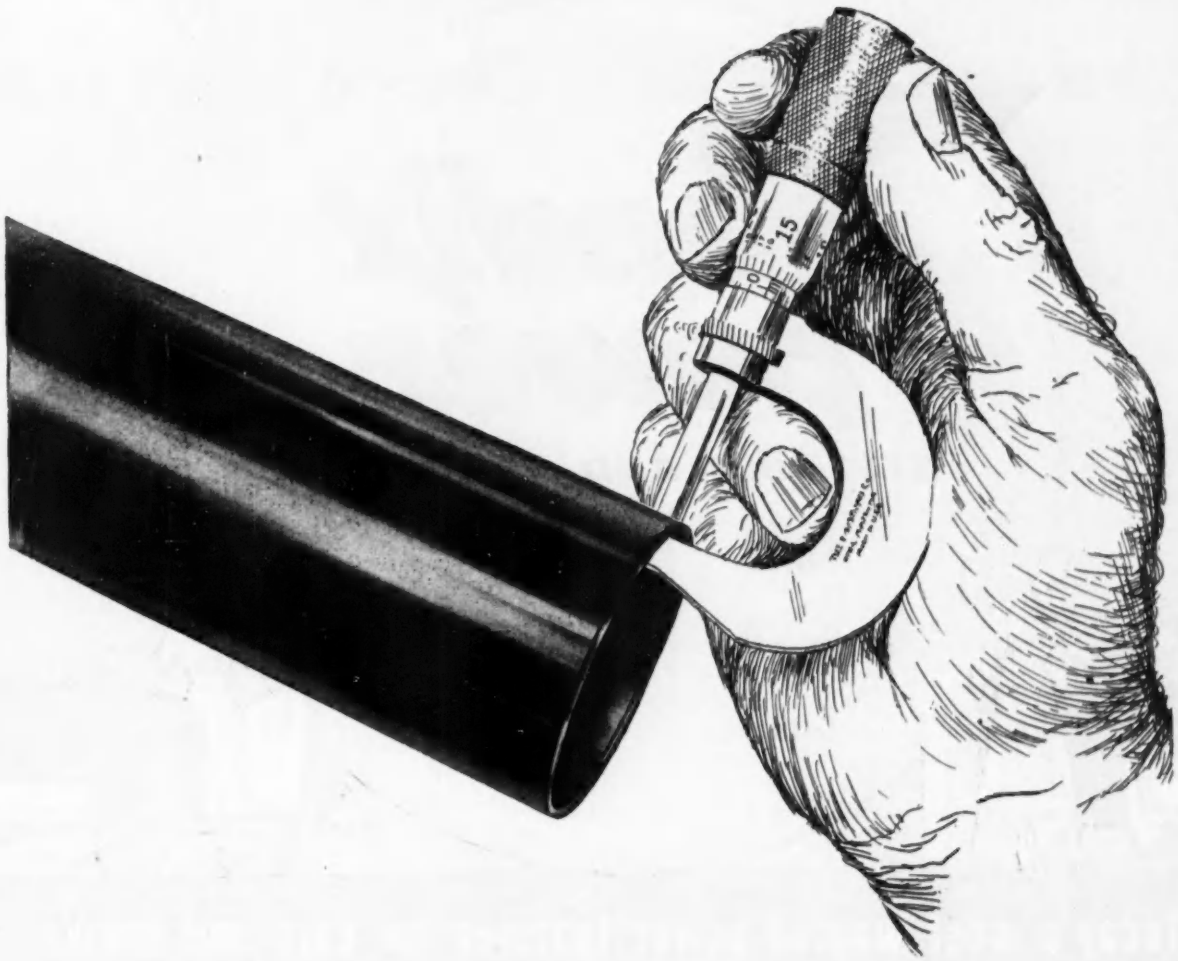
Action speaks better

MATERIAL—ALUMINUM: Hole drilled with 1" and 1 1/16" dia. drills to 1½" depth, and tapped to ¾" depth.

	HSS	CARBIDE
Cycle Time	90 secs.	11 secs.
Work Spindle Speed	270 R.P.M. at 104 S.F.	830 R.P.M. at 320 S.F.
Tool Wear	5,000 pcs. per grind	20,000 pcs. per grind

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.



It has to be accurate ...it's welded tubing

• Since welded tubing is formed from flat strip, the wall thickness must be uniform throughout. This advantage is so well recognized that tolerances for wall eccentricity are not commonly included in specifications.

Brainard welded steel tubing is an economical structural material, and it offers many such physical advantages. Can it cut costs or reduce weight in *your* product designs? For complete information write Brainard Steel Division, Dept. W-7, Griswold Street, Warren, Ohio. An integrated producer; offices throughout the U. S.

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WELDED STEEL TUBING

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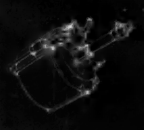
STEERING AND BRAKING

sells more cars

satisfies more customers

Today's most wanted power features for cars and trucks



Bendix * low pedal • POWER brake

Specified by more car manufacturers than any other make, Bendix Low Pedal Power Brake makes possible quick, sure stops by merely pivoting the foot from stop-and-go controls. No need to lift the foot and exert leg power to bring the car to a stop. Result—more driving comfort, less fatigue and greater safety!

Bendix * POWER steering

Because Bendix Power Steering is of the linkage type, vehicle manufacturers find it especially adaptable for production line installation, without extensive engineering changes. Manufacturers can now meet the increasing demand for power steering more efficiently and more economically with Bendix Power Steering.

Bendix HYDROVAC* POWER brake

With over four million in use, the Bendix Hydrovac is by all odds the world's most widely used power brake for commercial vehicles. This overwhelming preference for Hydrovac is a result of sound engineering design, exceptional performance, low original cost and minimum service upkeep.

Bendix AIR-PAK* POWER brake

With one simple compact unit, Bendix Air-Pak combines all of the well-proven advantages of hydraulic brake actuation with an air brake system. An important advantage of Air-Pak is that brakes can be applied by foot power alone when braking is required before air pressure builds up or if it should fail for any reason.

*REG. U.S. PAT. OFF.

The term "Bendix Power" not only identifies the industry's outstanding power braking and power steering equipment, but describes the unmatched engineering and manufacturing resources behind these products.

It is well that Bendix Products Division be thought of in this dual capacity, for the outstanding acceptance of Bendix power units stems largely from the fact that industry has learned over the years to look to Bendix for the latest and best in power equipment for cars, trucks and buses.

Bendix Products Division

BENDIX PRODUCTS DIVISION SOUTH BEND INDIANA

Bendix AVIATION CORPORATION

Export Sales: Bendix International Div. 205 E. 42nd Street, New York 17, N. Y.

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High Spots of This Issue

★ Power Steering Gear Parts Require Precision Operations

This sequel to a previous article on the production of power steering gear by Saginaw Steering Gear Div. of General Motors Corp. discusses parts and assembly manufacture. A thorough review of various work phases is given. Page 32.

★ An Advanced Bus Suspension Design

There has been an unfortunate tendency among designers of buses to let design of the suspension take a back seat to the other elements. In this project, however, the suspension was given equal priority with good results. Page 38.

★ Improved Methods Accelerate Corvette Production

Now in quantity output of the world's first mass-produced sports car, Chevrolet's St. Louis plant is a veritable beehive of activity. Latest refinements in handling of plastics and other operations are studied here. See Page 42.

★ Prospects for Small Industrial Gas Turbines

While great promise for specialized applications has been shown by the small industrial gas turbine, its exact future remains in abeyance. The author reviews experience with the Boeing unit and its potentialities. Page 46.

★ Latest Trends in Hot Rods

No longer can hot rodding be disparaged as a dangerous pastime for reckless fools, as it has now become a well-organized national sport. Some of the ingenious engineering innovations it has produced are reviewed here. Page 54.

★ 41 New Product Items And Other High Spots, Such As:

New car registrations; British two-stroke Diesel; ultrasonic inspection; new material for wood patterns, die molds; new Lancia truck; French truck has separate drive for each front wheel; smog and exhaust fumes; largest die-casting machine; versatility of electronic computers; and Le Mans Race.

Automotive and Aviation News, Page 17
Complete Table of Contents, Page 3

AUTOMOTIVE INDUSTRIES COVERS
PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY • PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
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News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 111, No. 2 July 15, 1954

Packard Gets Into Full Swing On Production of Own Bodies

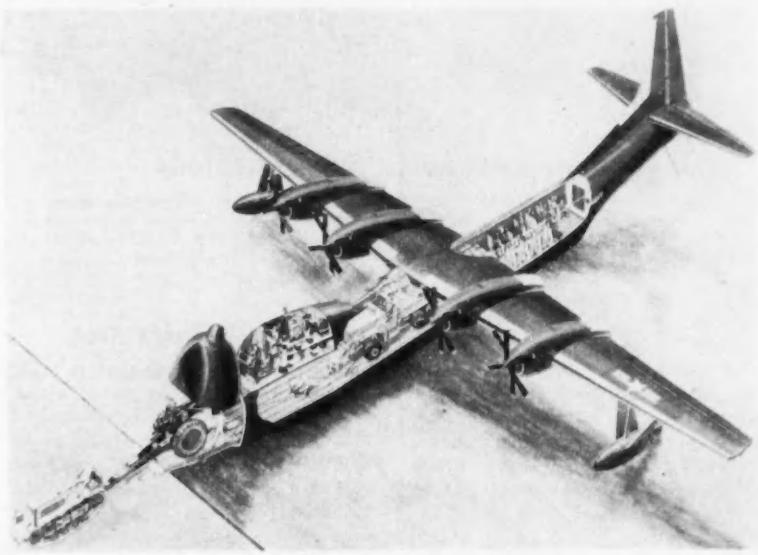
Packard recently started shipping cars to its dealers which, for the first time in many years, bear the designation "body-crafted by Packard." The company has organized a new 1700-man body-building team, has taken over the former Briggs-Conner plant in Detroit, and is now in full production of its own bodies in the new facility.

In addition to conducting body operations, Packard plans to expand the plant's utility to a broader program of custom-building cars and of research into new techniques of car body craftsmanship. It is reported that much of this research is likely to be concerned with additional uses of plastics.

Ford Charts Vast Expansion Program

Ford Motor Co., which will soon start on the last phase of an $80 million expansion program begun in 1947, is preparing plans for another possible expansion move on which it expects to spend a record amount, perhaps more than $1 billion. While no target date has been set for the long-range plan and details of what it would involve are not definite, the company has stated that a final decision may be dependent upon factors "which are not purely economic."

Ford since 1946 has spent more than $1.4 billion on new plants and equipment. Just recently it announced that construction would start on three new buildings and an annex to a present one for its Engineering Staff's Research and Engineering Center in Dearborn, Mich., which are expected to add one million sq ft of space to existing facilities. The newest program contemplated by the company would cover the next five years.



OPEN-FRONT TURBOPROP SEAPLANE

Cutaway sketch shows new Convair R3Y-2, multi-purpose, bow-loader version of the Navy's Tradewind transport. Like a flying LST, the huge seaplane can carry troops and equipment directly to an enemy beach. Four 155 mm howitzers, three 2½-ton trucks or six jeeps can be accommodated on 88-ft long cargo deck. Four Allison T-40 turboprop engines develop a total of 22,000 hp.

Benson Ford, vice-president of the company, explained that, if the company should guess wrong on its long-range plan or if competition should beat it to the punch with a radically advanced product, "we may take a really serious drubbing."

Nash Adds 32 Outlets To Dealer Organization

The fight by independent car companies which have been joining with one another to gain a bigger share of the market is gaining new impetus. Nash, which recently consolidated with Hudson into American Motors Corp., added 32 new car dealers in 16 states during the first 10 working days in June.

Studebaker Introduces New Utility Vehicle

Studebaker has introduced a new utility vehicle designed to serve either as an ambulance, patrol car, or auxiliary emergency car. It is a modification of the Conestoga station wagon and will be available in four models —Deluxe Champion, Regal Champion, DeLuxe Commander, and Regal Commander.

The new vehicle is similar in nearly every aspect to the station wagon, except that it has provisions for installation of a four-wheel cot, siren, and two-way radio transmitter. Factory delivery price is the same as on the station wagon, but it does not include the extra equipment.

News of the AUTOMOTIVE

IHC HATCHES DOZEN TRUCK ADDITIONS

Pictured here is Model CO-195 Roadliner, one of 12 new cab-over-engine, heavy-duty trucks introduced by International Harvester. The complete line offers a range of GVW ratings from 21,000 to 30,000 lb and GCW ratings from 50,000 to 60,000 lb. All models are available in 99, 111, 123, 135, and 153-in. wheelbases.

Car Price Hikes Uncertain As Steel Costs Rise

At presstime, in the wake of the total nine to 10 cents an hour wage increase granted to steelworkers and the $3 per ton average increase announced by U. S. Steel Corp. in prices of its steel, there was uncertainty as to how higher steel costs might affect car prices. While aware of the fact that little time had elapsed for study of the problem, an effort was made by AUTOMOTIVE INDUSTRIES to feel out initial reaction to the possibility in the automobile industry.

One of the several car manufacturers contacted stated that it could not determine what course of action it would take until it was apparent how much its steel costs would go up and the types of steel involved. If the cost of a particular type of steel used extensively by the maker went up appreciably, then serious consideration would have to be given to an increase in car prices, it said.

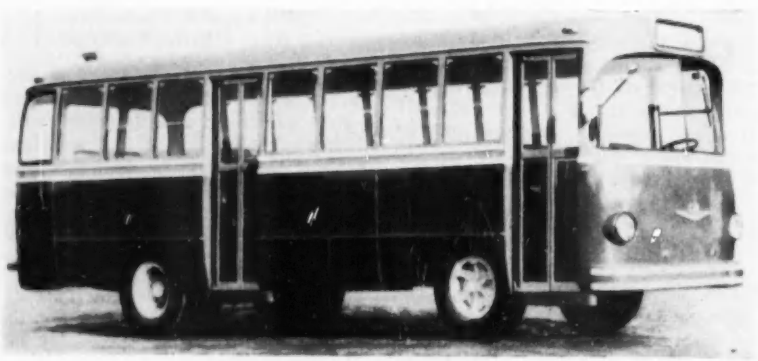
A spokesman for another car producer stated that action taken by vendors would largely determine its own procedure in the matter. He pointed out, however, that his company, among others, absorbed the last steel price increase and might do the same again.

Another company questioned on the subject stated that, as far as could be foreseen at the moment, its car prices would remain the same, regardless of added steel costs. All in all, it appears that this course may eventually be followed by most of the industry, because of a general reluctance to increase car prices in these highly competitive times.

Future of Murray Body Plant Dubious as Budd Drops Option

The recent disclosure by Budd Co. that it had let lapse the option it held to buy or lease the big automobile body-making plant of Murray Corp. in Detroit leaves in an uncertain state the future of this facility. While tooling for the Ford Thunderbird sports car at the Murray plant had been started early this year, it now seems reasonable to conjecture that Budd Co., which holds the contract for building the car, has transferred the work to its Detroit plant.

Loss of other body work by Murray in recent months clouds the situation still further. While Murray officials have declined to comment on future plans, it is possible that the plant, once remaining aircraft work and what body work is left are completed, may be closed down and sold.



REAR-ENGINE ITALIAN BUS

Passenger room in the OM Supertaurus bus, which now seats 32 persons, has been increased by placing the engine in the rear. The four-stroke, four-cyl Diesel power plant has an output of 90 bhp at 2100 rpm, bore of 115 mm, stroke of 140 mm.

Air-Heat System Offered By Nash for Ramblers

Nash is now offering the All-Weather Eye air-conditioning system for the Rambler two and four-door series. The air-heat system is a slightly smaller unit than the one available for the Ambassador and Statesman cars, but its basic makeup is the same as the larger units. All the components are located forward of the instrument panel.

The new unit for the Ramblers is selling for $50 less than its larger counterpart. It is priced at $345 factory installed, against $395 for the larger system.

AND AVIATION INDUSTRIES

Federal Motor Truck Sold To Mast-Foos Mfg. Co.

Federal-Fawick Corp. has sold the assets of its Federal Motor Truck Div. to Mast-Foos Manufacturing Co. The latter is a manufacturers' holding company in the heavy machinery and equipment fields.

The sale, for an undisclosed amount, consists of plant equipment and products of the Federal Motor Truck Div. at Detroit, and its branch at New York, N. Y. It is reported that for the time being, at least, there will be no changes in operations or personnel at Federal.

Federal Fawick has stated that the sale of Federal Motor Truck Div. relieves it of its only non-profit division. Furthermore, according to the company, it provides needed added capital for development and production of new products and will allow sales expansion in Federal-Fawick's other divisions.

Export Sales of Vehicles Higher Than Last Year

Export sales of motor vehicles are running higher than they were last year. During the first five months, a total of 178,066 new motor vehicles was shipped abroad, compared with 153,402 units in the same period last year. The figure represented 6.1 per cent of total sales, against 4.8 per cent in the five-month period of 1953.

Car Sales in First Half May Top 2.7 Million

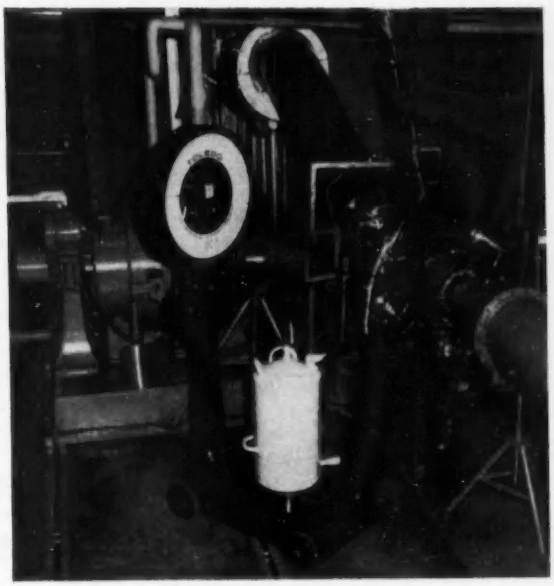
The automobile business enters the hot weather slowdown season with a show of confidence. Despite gloomy talk that sales were headed for a decline following the spring peak in May, a spurt in sales during June brought new encouragement to the industry.

Automobile sales figures up to mid-year, while still incomplete, were expected to top 2.7 million, based on estimates that June would fare as well as the two previous months; there were approximately 500,000 units sold in each of those months. This would bring the total sales for the six months of this year just slightly under the 2.8 units sold in the same period of 1953, and would be better than the mid-year total retail sales of 1952.

Production-wise, the industry should wind up the first half with close to three million units, against 3½ million in the first six months last year. Although production is expected to taper off slightly during the second half of the year, there is still a good possibility that this may be the third best year in history.

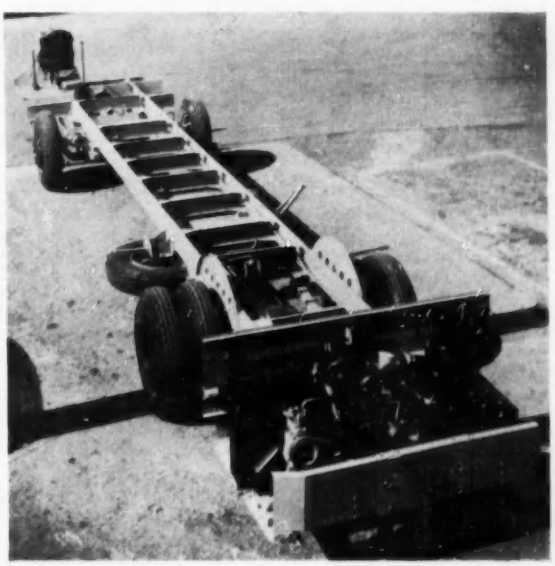
Used car sales continued to hold up strongly, as nationwide averages in May were about 2.3 per cent over the same month last year. The May figure was the third consecutive monthly increase over last year.

GAS TURBINE ON TEST RUN



Depicted here is an automotive gas turbine on a test stand in the Gas Turbine Test Building at the General Motors Technical Center. This is but one of the many facilities available for testing virtually all types of gas turbines. The 240-ft long building contains seven test cells and is equipped with elaborate instrumentation.

SCHOOL BUS M-H CHASSIS



This new transit-type chassis, designed especially for school bus service, is now being offered by Marmon - Herrington Co. Known as the Safe-Way, it is available in three lengths to seat 61, 67, and 73 passengers, respectively. Rear power plant is a Ford 317 cu in., ohv, 165-hp V-8 engine. Transmission is a five-speed, synchronized Clark unit.

News of the AUTOMOTIVE

Yale & Towne Shows New Truck In Chicago Road Show Display

Late last month Yale & Towne Mfg. Co. held a two-day stand of its Traveling Materials Handling Road Show at Soldiers' Field, Chicago. The exposition started on its tour 18 months ago and has demonstrated Yale & Towne equipment before 70,000 businessmen in the U. S. and Canada during some 25,000 miles of travel.

Shown for the first time at the Chicago affair was the new Yale G-52 Series of 2000, 3000, and 4000-lb industrial gas fork lift trucks with fluid couplings. Complete details on this new unit will appear in a forthcoming issue of AUTOMOTIVE INDUSTRIES. Also on display for the first time in the Midwest was the Yale Safety Silhouette electric fork lift truck.

During the course of an address made in conjunction with the occasion, Elmer F. Twyman, vice-president of Yale & Towne Mfg. Co., drew several interesting parallels between the company's industrial lift truck business today and the automobile industry. In particular, he noted the similar existence of product variety, service facilities, financing organization, activity in trade-ins and used trucks, and importance of styling.

BRITISH FORK LIFT

Power steering and power brakes have both been incorporated in this fork lift truck exhibited at the recent British Industries Fair. The Shelvoke and Drewry Freightlifter has a maximum fork elevation of 20 ft with telescopic mast and a load capacity of 18,000 lb. It is powered by a 70-hp gasoline or Diesel engine.

Flex-O-Tube to Up Output At New Michigan Plant

Flex-O-Tube Div. of Meridian Corp. expects to increase its production by 50 per cent at its newly-completed $500,000 plant in Inkster, Mich. The division supplies flexible hose assemblies to the automobile industry.

Union Offer to Sell Cars Is Turned Down by Kaiser

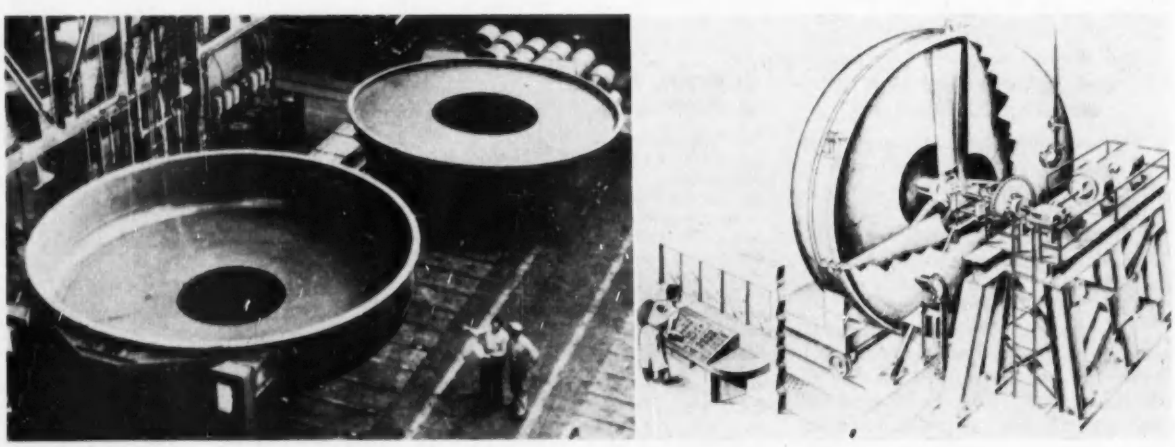
After careful consideration, Kaiser Motors Corp. has decided to decline the offer of Willys Local 12 UAW-CIO to serve as Ohio distributor for Willys and Kaiser products. It gave no reason for turning down the proposal. It is believed, however, that the decision was based in part on the belief the union lacked the experience to sell automobiles.

In order to enter the automobile business, the union planned to buy out the present Kaiser-Willys distributor, L. G. Worman, Inc., located in Toledo. The union had offered $300,000 to set up the proposed company and had hoped eventually to capitalize it at $1 million. It had already filed incorporation papers.

Bendix To Supply Ford, L-M With Radio Sets

Bendix Aviation Corp. will supply all of the radios for the 1955 Lincoln and Mercury cars. Ford also reportedly will switch over to using Bendix eight-tube receivers shortly.

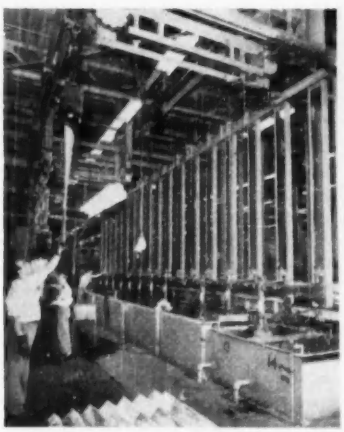
Lincoln-Mercury Div. and Ford have been using Sylvania eight-tube radios in their cars since 1950. Ford will continue to get its six-tube units from Bendix and Motorola.



SPUN STEEL HEADS FORM LARGE CLAMSHELL

These giant steel "bowls," together weighing more than 22 tons, were recently completed by Lukens Steel Co. for Hamilton Standard Div. of United Aircraft Corp. Spun on a 276-in. flanging machine, the two 20½-ft diam halves will be used to form a "Clamshell." This is a new device for measuring propeller dynamic and aerodynamic unbalance of speeds and blade angles in true flight.

AND AVIATION INDUSTRIES



PROPELLER PLATER

This automatic plating machine, with a 10½-ft vertical lift, is bringing marked improvement to the zinc-plating of steel propeller blades at Hamilton Standard Div. of United Aircraft Corp. Built by Hanson-Van Winkle-Munning Co., the machine handles 12 blades at once in its main plating tank and has space for as many as 25 blades in various stages of its operation.

Nash, Hudson Link Parts Operations

Nash and Hudson will combine their main parts divisions in Milwaukee under the newly formed American Motors Corp. The new Parts Div. will be located in the present Nash parts plant in that city and will control distribution of replacement parts and accessories, inventories and procurement for the two car divisions. Nash and Hudson will continue to merchandise the items separately, however.

Chicago Show Dates Portend Earlier 1955 Car Unveilings

The disclosure that the 1955 Chicago Automobile Show will be held Jan. 8 to 16, instead of in mid-March, supports the belief that next year's car models will make their bows considerably earlier than has been the custom thus far in the post-war years. It seems reasonable to assume that the great majority will be announced at least in the December-January period, if not sooner.

AI TABLOID

United-Carr Fastener Co. has acquired all the capital stock of the Palnut Co. . . . Bigelow-Sanford Carpet Co. has taken over the assets of LeConte Plastics Co., Inc. . . . Baldwin-Lima-Hamilton Corp. has acquired all outstanding stock of O. S. Peters Co.

• • •

American Bosch Corp. and Arma Corp., its wholly owned subsidiary, are merging into a single company. New name will be American Bosch Arma Corp.

• • •

Construction has started on the new Jones & Laughlin $1.5 million research center. . . . Timken Roller Bearing Co. will build an atomic bomb proof vault at its New Philadelphia plant.

• • •

Canadian Steel Improvement, Ltd., has produced prototype quantities of a new type of forged precision titanium alloy jet engine blade. It is expected to give a big boost to A. V. Roe's jet development program.

• • •

Du Pont Co. plans to build a freon plant on the site of its Louisville works. . . . Eclipse Fuel Engineering Co. has announced plans for a new plant at Toronto, Ont.

• • •

Denison Engineering Co. has established a new Aircraft Products Div. . . . Wallace Aviation Corp. is a new firm formed to make jet compressor and turbine blades.

• • •

Eastern Industries, Inc., has put on the market a radar deducting device on stop lights which changes signal to meet traffic flows.

• • •

"Radiation Digest" is the title of a new industrial house organ being published by the X-Ray Dept. of General Electric Co.

Schmieg Industries, Inc., has increased its plant manufacturing capacity 60 per cent. . . . Reynolds Metals is undertaking a $2.585 million program to expand and modernize sheet mill facilities at Sheffield, Ala.

• • •

Fairchild Engine & Airplane Corp. will open a facility for its Aircraft Div. at St. Augustine, Fla. . . . Greer Hydraulics, Inc., has dedicated its new plant and offices at New York International Airport.

• • •

Western manufacturers of powdered metal parts have formed an association known as West Coast Powdered Metal Parts Fabricators.

• • •

Dow Chemical Co. has added a tough polystyrene to its plastics line. It is known as "Styron 480" and is said to be extremely rugged.

• • •

General Electric Co. has announced a new film on Productive Maintenance. It shows industry how to get the most productivity out of existing facilities.

• • •

Birdsboro Steel Foundry & Machine Co. has agreed to sell substantially all of its assets to a New York investor for $3.97 million, roughly $20 a share of outstanding stock. The deal is still subject to stockholder approval.

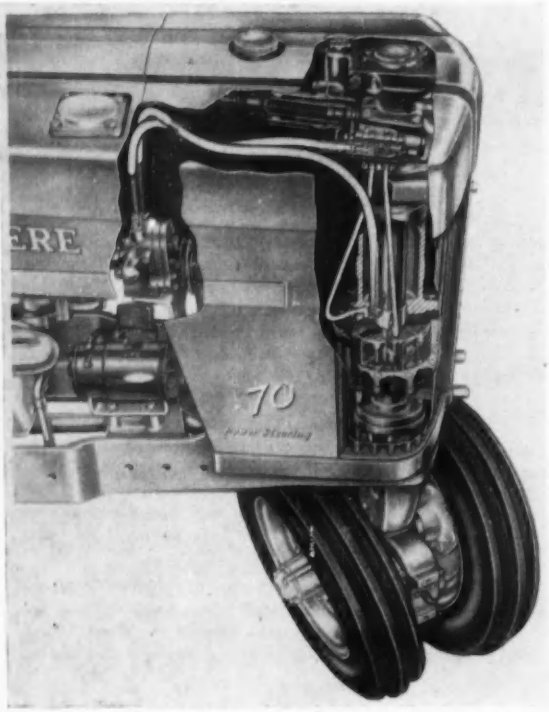
• • •

Three modified stainless steel alloys, which reportedly may release critical metals used in jet aircraft for other military and industrial needs, have been developed for the Navy Bureau of Aeronautics by Cornell Aeronautical Laboratory.

• • •

France will hold its next international aviation exhibition in June, 1955, on Bourget field. A special building is being constructed for it.

News of the AUTOMOTIVE



STEERING EASE FOR TRACTORS

Now available as optional equipment on new John Deere Models "50", "60", and "70" tractors is this integral, factory-engineered power steering unit. The device, said to be the first of its kind for row-crop tractors, operates whenever the tractor engine is running; manual steering takes over when the engine is shut off.

SIX MONTHS PRODUCTION DOWN 10% FROM 1953

1954 Passenger Car Production

As reported to Automotive Industries by the car factories

	June 1954	May 1954	June 1953	Six Months 1954	Six Months 1953
Chrysler	7,648	8,185	19,043	56,833	101,264
De Soto	4,741	5,387	13,904	37,600	73,973
Dodge	11,885	11,368	33,505	67,950	182,243
Plymouth	43,705	33,697	68,750	216,398	341,132
Total—Chrysler Group	67,979	58,637	133,212	378,781	698,612
Ford	126,541	126,698	91,452	750,049	504,706
Lincoln	2,879	2,966	5,853	22,095	27,951
Mercury	22,831	22,336	21,963	153,135	125,279
Total—Ford Group	152,251	151,000	118,968	925,279	657,936
Buick	49,248	51,183	52,738	287,042	277,155
Cadillac	12,280	11,250	11,008	61,741	62,851
Chevrolet	130,456	130,957	144,663	760,709	774,262
Oldsmobile	44,169	43,045	38,202	223,962	196,772
Pontiac	29,489	31,925	44,829	194,605	230,440
Total—G. M. Group	264,842	268,360	291,440	1,528,119	1,541,480
Hudson	3,878	2,489	6,190	14,296	50,139
Nash	4,964	6,020	14,045	37,315	100,301
Total—American Motors	8,842	8,499	20,235	51,611	150,440
Henry J	.....	.....	84	.....	5,896
Kaiser	950	1,425	1,127	5,370	13,666
Willys	1,362	1,551	None	8,380	24,317
Total—Kaiser Motors	2,312	2,976	1,211	13,750	43,879
Packard	3,012	1,557	9,161	19,554	59,923
Studebaker	6,179	4,691	14,338	14,336	99,502
Total—All Makes	503,616	495,710	588,565	2,931,420	3,256,772

Israel Firm Negotiating For Crosley Car Rights

Speculation about the ultimate disposition of the tools, dies, and equipment used in the manufacture of Crosley cars was given fresh stimulus by the recent report that the Abena Investment & Development Co. of Israel is interested in purchasing the facilities and rights from Aerojet-General Corp., subsidiary of General Tire & Rubber Co. An earlier report that General was interested in producing these cars in Israel and that negotiations were in progress for the supplying of engines by Aerojet was denied officially by General Tire & Rubber Co.

If the negotiations go through, the Israel firm would build the body and chassis, but it presumably might have to find another source for engines. General has confirmed that Aerojet has been building versions of the Crosley engine for various industrial uses, including installations in refrigeration units and marine conversions. It is doubtful whether the quantities required for the Israel project would make it practical to ship engines overseas.

In any event, the Israel firm is said to plan production of Crosley cars and station wagons, building the bodies and chassis in Tel Aviv, at a rate of 50 cars a day. The car is expected to sell for about $1,000.

News reports also intimate that the company hopes to market these cars in the U. S. This speculation is discounted by competent observers on the basis that if there had been a demand for such cars in the U. S., Crosley would still be in business.

Crosley Motors stopped buildings cars in June, 1952. Shortly thereafter, General Tire acquired control from Powell Crosley, Jr., founder and president. At the time Crosley had an inventory of $350,000 of chassis and body parts on hand.

Federal Mogul Expanding Greenville, Mich., Plant

Federal Mogul Corp. will construct an annex to its plant in Greenville, Mich., which will increase floor space by more than 200,000 sq ft. The addition will cost about $200,000.

AND AVIATION INDUSTRIES

AHS Forum Pinpoints Growth Of Helicopter Applications

Helicopter builders discussed the current status of their industry and its future outlook during the 10th Annual Forum of the American Helicopter Society in Washington late last month in an atmosphere that bespoke confidence. Extremely proud of the achievements to date of the "whirlybirds," the manufacturers are definitely out to prove the further versatility of their rotary-wing aircraft.

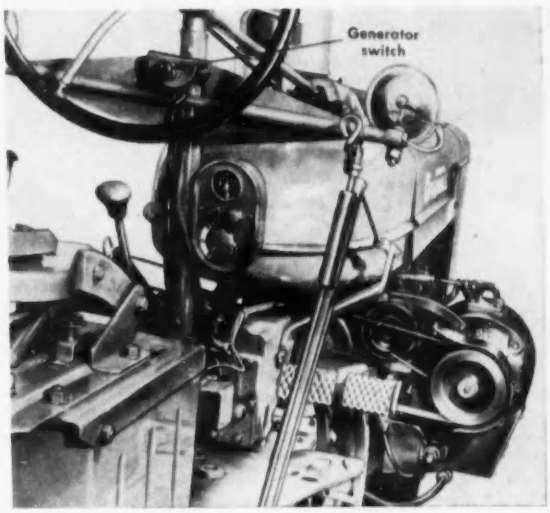
Thirty-eight booths at the meeting contained exhibits by helicopter manufacturers, their suppliers, and the Armed Forces. In the first group were such well-known makers as Sikorsky, Piasecki, Kaman, and Bell, while in the second were helicopter gas-turbine manufacturers such as General Electric, Boeing, and Continental Aviation. At the concurrent technical sessions, helicopter design and operational problems and gas turbines were discussed.

The Navy announced successful flight tests of a secret rotary-wing "drone" plane and the development of a new lightweight, homing torpedo to be used by helicopters against submerged submarines. The pilotless helicopter was designed and built by Kaman Aircraft, while the carrier plane for the new torpedo is said to be the new Bell HSL helicopter.

President of the Society for the ensuing year is John P. W. Vest of Sikorsky Aircraft. Other principal officers elected were Henry S. Tremper of Piasecki, secretary, and Col. William S. Bunker, treasurer.

Ramo-Woolridge Forms New Subsidiary Firm

Ramo-Woolridge Corp. has announced formation of a wholly-owned subsidiary, Pacific Semiconductors, Inc., to develop, manufacture and sell semiconductor devices such as diodes and transistors of advanced design. Thompson Products, Inc., reportedly is investing $3 million in the new firm. The company will be headed by Dr. Harper Q. North, formerly director of the Semi-Conductor Div. of Hughes Aircraft Co. He anticipates the new organization will be in commercial production within a year.



Ease of control to the operator is a feature of the Electrall system. A button switch on the tractor to operate the motor on the implement is readily reached.

IHC Demonstrates Generator for Farm Tractors, Trucks

International Harvester Co. has disclosed an experimental electric generating system designed to make the farm tractor a mobile source of electric power, as well as mechanical power, for farming operations. The "Electrall" system, mounted on Harvester's largest current model Farmall tractor, was shown to press representatives recently.

At the same time, it was revealed that Harvester engineers are now applying the Electrall unit experimentally also to motor trucks for farm and industrial use. General Electric Co. designed and made the specialized electrical equipment involved.

Wide use of the generator in the trucking industry in coming years is foreseen by International Harvester. At the press demonstration three IH trucks—an R-120, a heavy-duty pickup, and a Metro panel—illustrated some of the uses of Electrall.

The unit powered a band saw, a

(*Turn to page* 174, *please*)

FIVE-MONTHS CAR FACTORY SALES OFF 7%, TRUCKS 16%

1954 U. S. Motor Vehicle Factory Sales*

	Passenger Cars	Trucks	Buses	Totals 1954	Totals 1953
January	454,562	96,167	401	551,130	564,470
February	446,676	87,141	326	534,143	582,200
March	531,529	101,177	296	633,002	700,439
April	534,667	96,723	379	631,769	722,675
May	497,062	91,226	273	588,561	642,132
Total—Five Months	2,464,496	472,434	1,675	2,938,605	3,211,916

1954 U. S. Motor Truck Factory Sales By GVW*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	45,560	17,492	3,608	17,738	3,658	4,890	3,224	96,167
February	39,373	16,210	3,207	15,656	3,973	5,572	3,150	87,141
March	45,588	16,841	3,719	19,446	4,473	5,496	3,614	101,177
April	43,187	16,023	3,735	18,906	4,146	5,264	3,352	96,723
May	41,950	16,895	3,329	16,956	3,950	4,733	3,411	91,226
Total—5 Mos. 1954	215,658	87,461	17,618	88,791	20,200	25,955	16,751	472,434
Total—5 Mos. 1953	257,613	106,888	23,009	96,984	23,865	43,290	21,028	562,865

*—Automobile Manufacturers Association.

Nothing Missing in the LINK!

Link Hi-Precision Gear Box, one of many in the Flight Simulator, shows the New Department **ball** bearings that maintain accurate gear pitch-line contact . . . almost entirely eliminate backlash and friction.

Take off . . . rough weather . . . enemy aircraft . . . Link's F-89D Jet Flight Simulator provides nearly every flight situation without getting off the ground. Extensive use of New Departure **ball** bearings throughout assures the same operational characteristics, the same smoothness and accuracy, so essential in actual aircraft equipment.

These high-precision **ball** bearings provide low starting torque, very low running friction and exact location of vital parts, irrespective of operating position.

If you design for aircraft equipment, it *will pay you to talk to your New Departure engineer, today!*

NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Plants also in Meriden, Connecticut, and Sandusky, Ohio
In Canada: McKinnon Industries, Ltd., St. Catharines, Ontario

Men in the News

Vickers, Inc.—Berton E. Rogers has been appointed general factory manager.

Wallace Barnes Co.—Jefferson S. Gamble was made sales manager, and Joseph T. Domingue succeeds him as assistant sales manager in charge of spring sales for this Associated Spring Corp. Div.

Autocar Div., White Motor Co.—Harry L. White was named sales manager.

Chance Vought Aircraft, Inc.—**Charles J. McCarthy** has been elected chairman of the board.

Chrysler Corp.—**C. L. Jacobson** and **F. W. Misch** were elected vice-presidents.

Cincinnati Shaper Co.—**Frank Pfefferle** is now special projects manager; **Alfred Baumgartner,** sales manager; and **Joseph Warren,** advertising manager.

Electric Auto-Lite Co., Battery Plant Div.—**Rolly W. Fitch** is now manager, and **Nels E. Hehner** is his assistant.

Rem-Cru Titanium, Inc.—**C. I. Bradford** was named president and a member of the board, while **R. S. Poister** was elected chairman of the board.

MoPar Parts Div., Chrysler Corp.—**T. E. Waterfall** was elected president.

Metal & Thermit Corp.—**H. E. Martin** has been elected president and a director.

Budd Co.—**E. R. Schmidt** was elected to the board of directors.

Russell, Burdsall & Ward Bolt and Nut Co.—**William E. Ward** has been elected president and general manager; **Evans Ward,** chairman of the board and chief executive officer; **Samuel N. Comly,** executive vice-president; and **John B. Gates,** treasurer.

Plymouth Motor Corp.—**Paul M. Ruef** is now a member of the executive sales staff.

Eaton Mfg. Co., Dynamatic Div.—**G. E. Walk** is now sales manager.

Timken Roller Bearing Co.—**Herchel M. Richey** has been named general factory manager; **Henry A. Tobey,** factory manager of the Canton and Gambrinus bearing factories; and **Wilbur L. Young,** general superintendent of the Canton Bearing Div.

U. S. Rubber Co.—**Chester J. Noonan** has been appointed executive general manager of the Footwear and General Products Div. and the Mechanical Goods Div.

Kaiser Metal Products, Inc.—**John L. Hallett** is now vice-president in charge of aircraft production, and **Paul C. Meyer** has become president in charge of administration.

Automotive Rubber Co.—**R. P. Ganchan** was elected a vice-president.

Jones & Lamson Machine Co.—Hardage L. Andrews, president, has been appointed to the board of directors of the National Association of Manufacturers.

Mather Spring Co.—**Richard W. Bartlett** has been named director of purchasing and production planning at all plants.

Solventol Chemical Products, Inc., Metal Cleaning Div.—**Julius R. Bellow** has been promoted to manufacturing manager, and **Ivan Ross** has become special engineering consultant.

Square D Co.—**Donald H. Jensen** has been appointed director of public relations.

Hooker Electrochemical Co.—**Hiram B. Young** has been elected vice-president in charge of western operations; and **F. Leonard Bryant,** works manager of the Tacoma, Wash., plant.

(*Turn to page* 170, *please*)

Necrology

Dr. Karl T. Compton, 66, top physicist, chairman of Massachusetts Institute of Technology, and a director of General Motors Corp., died June 22, at New York, N. Y.

Clarence W. Hamilton, 62, public relations director and administrative staff member at Sheffield Corp., died June 7, at Little Current, Ont.

Dr. William O. Hotchkiss, 75, retired president of Rensselaer Polytechnic Institute, died June 20, at Scarsdale, N. Y.

Harry C. Allan, secretary-treasurer and a director of Electric Storage Battery Co., died June 23, at Philadelphia, Pa.

James T. Roche, Jr., 68, retired sales manager of the old Locomobile Co., died June 22, at Bridgeport, Conn.

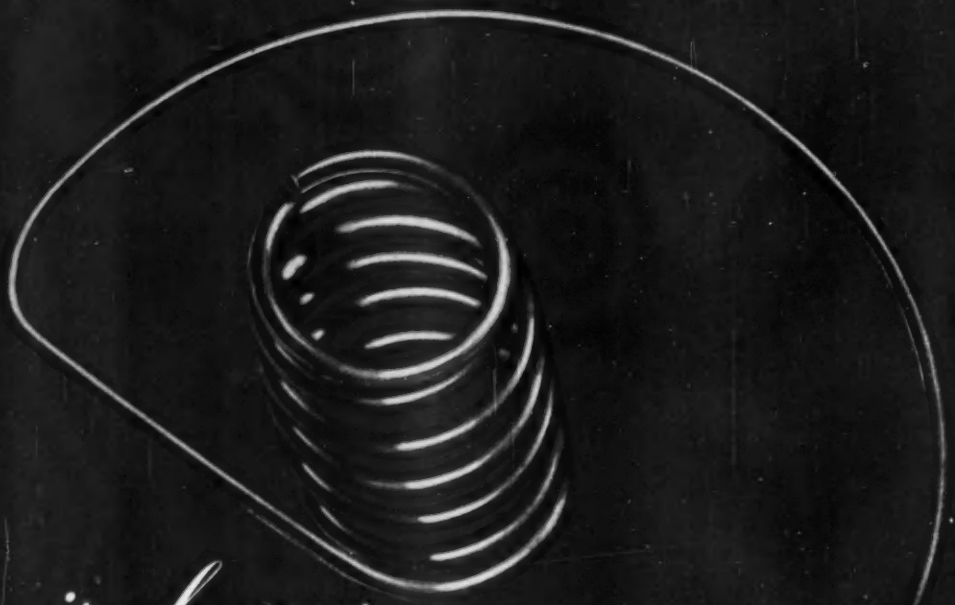
Rawson Vaile, 67, executive vice-president and director of American Blower Corp., died June 19, at Detroit, Mich.

William H. Sauerback, 58, assistant general superintendent of the Chrysler Highland Park Div., was killed June 11 in an automobile accident.

Robert J. Gordon, III, 33, assistant director of the Dodge News Service, Grant Advertising, Inc., was injured fatally June 25 in an automobile accident.

Capt. John O. Huse, 56, USN (ret.), vice-president and sales manager of Chrysler Motor Parts Corp., died June 28, at Detroit, Mich.

a SPRING



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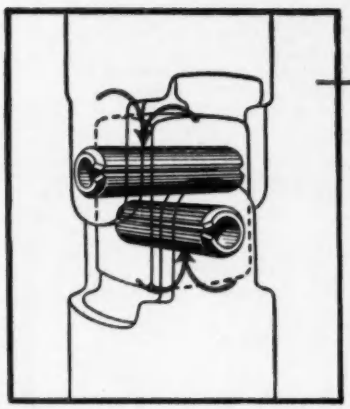
F. N. MANROSS AND SONS CO. BRISTOL CONNECTICUT	**OHIO DIVISION** 1825 EAST FIRST ST. DAYTON, OHIO	**DUNBAR BROTHERS COMPANY** BRISTOL, CONN.	**MILWAUKEE DIVISION** 341 E. ERIE ST. MILWAUKEE, WIS.	**SEABOARD Coil Spring Div.** 15001 S. BROADWAY GARDENA, CALIF.	



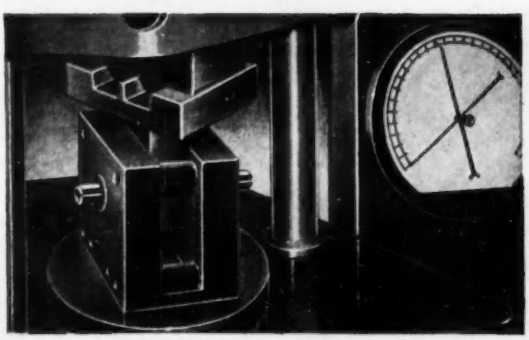
Normal leverage puts the load on the pins at these points. Pins must have a high resistance to shearing – and every pin must stand up to plenty of abuse. Many manufacturers' tests have proved Rollpin's uniformly high shear strength.

consistent strength... as important in the pin as in the socket

The Moore Drop Forging Company, who manufactures the famous Craftsman wrenches for Sears Roebuck and Co., used stainless steel rivets to fasten the universal joint on their Flex sockets. Thorough testing, under all possible load conditions and drive angles, convinced them that Rollpin was stronger than the stainless steel rivet previously used. This led to a redesign of the joint with Rollpins replacing the rivets. Also, the spring tension inherent in the Rollpin locking principle was used to provide the "drag" that holds the socket head in angular position. The result . . . an improved product at lower cost.

Dependability like this is based on the rigid ESNA® quality controls that insure consistent strength and mean reliable performance by every Rollpin.

Moore Drop Forging Company was able to save assembly time, too. Rollpin is simply driven into holes drilled to normal production tolerances. It compresses as driven, locking itself in place by exerting pressure on the hole walls. In this case, the extra operation of spinning on a rivet head was eliminated.



We urge you to test spring pins before you buy – for uniformity of diameter and length, hardness, insertion and removal forces, and recovery of diameter, as well as shear strength.

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Dept. R29-75, Elastic Stop Nut Corporation of America
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Please send me the following free fastening information:

☐ Rollpin samples
☐ Rollpin bulletin
☐ Here is a drawing of our product. What self-locking fastener would you suggest?

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Firm_____

Street_____

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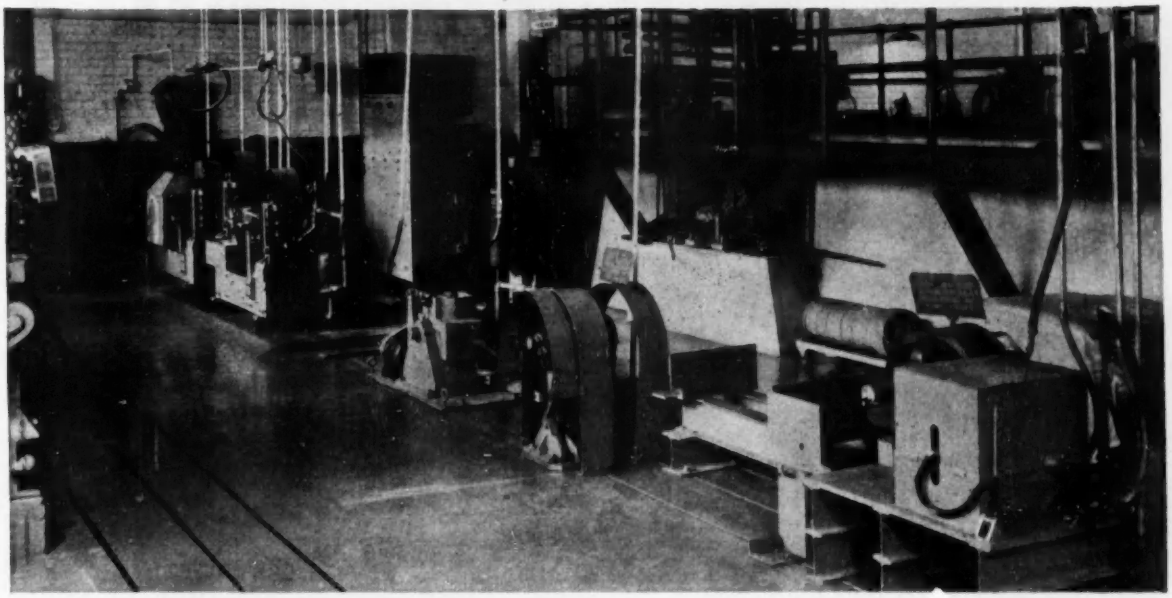
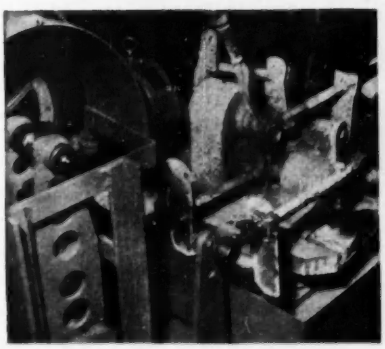
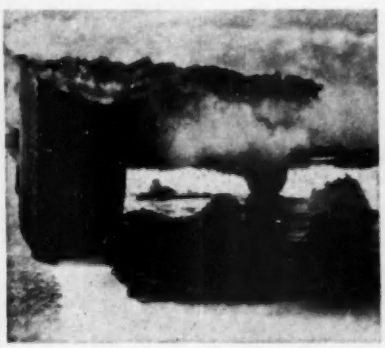


THOMPSON MAINTAINS THIS "TORTURE CHAMBER" in their Detroit laboratories to "performance-test" steering-linkage units under the most extreme conditions . . . tests that reveal the slightest imperfection.

Every one of these machines shown above faithfully duplicates difficult road conditions: gritty mud . . . dirty water . . . grinding friction . . . and jarring impacts, as frequently as ten 500-pound blows *per second!*





DOUBLE-Tested—Week after week, 24 hours a day, extra-severe punishment is dealt out to Thompson's experimental and standard tie rods, sockets, center links and drag links. In addition to this rigorous testing in Thompson's Detroit laboratories, these parts undergo furthur tests in standard-model cars out on the open road...not only on average highways but also on rutty, muddy back roads as well.

They MUST Be Right—Nothing less than perfectly-engineered parts, made of the finest metals, can survive these grueling tests which Thompson sets up in a constant search for *improvement*... in materials, in performance, in manufacturing procedures. New materials, new processes and new designs are all subjected to these rigid Performance Tests... and always under the most extreme conditions.

The Results?—These exacting tests . . . followed by periodic skilled analyses by experienced Thompson engineers . . . result in the finest possible linkage systems for America's cars, trucks, buses and tractors.

If you have a steering linkage problem, just write or phone Thompson Products, Michigan Plant, 7881 Conant Avenue, Detroit 11, Michigan, WA 1-5010.

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DRILLING MACHINE

ENGINEERED FOR PRODUCTION

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THE FOOTE-BURT COMPANY
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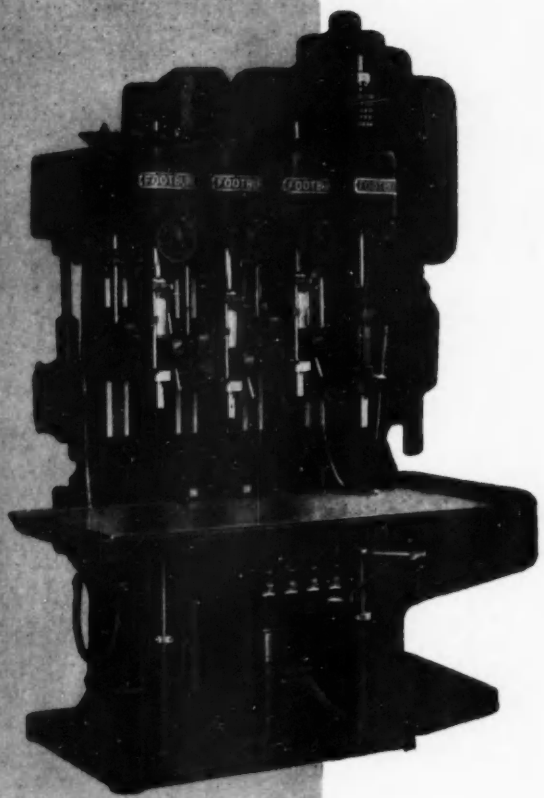

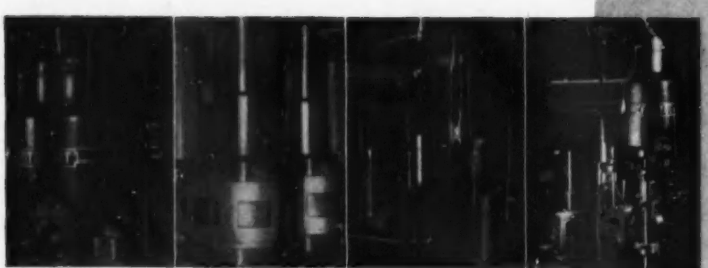

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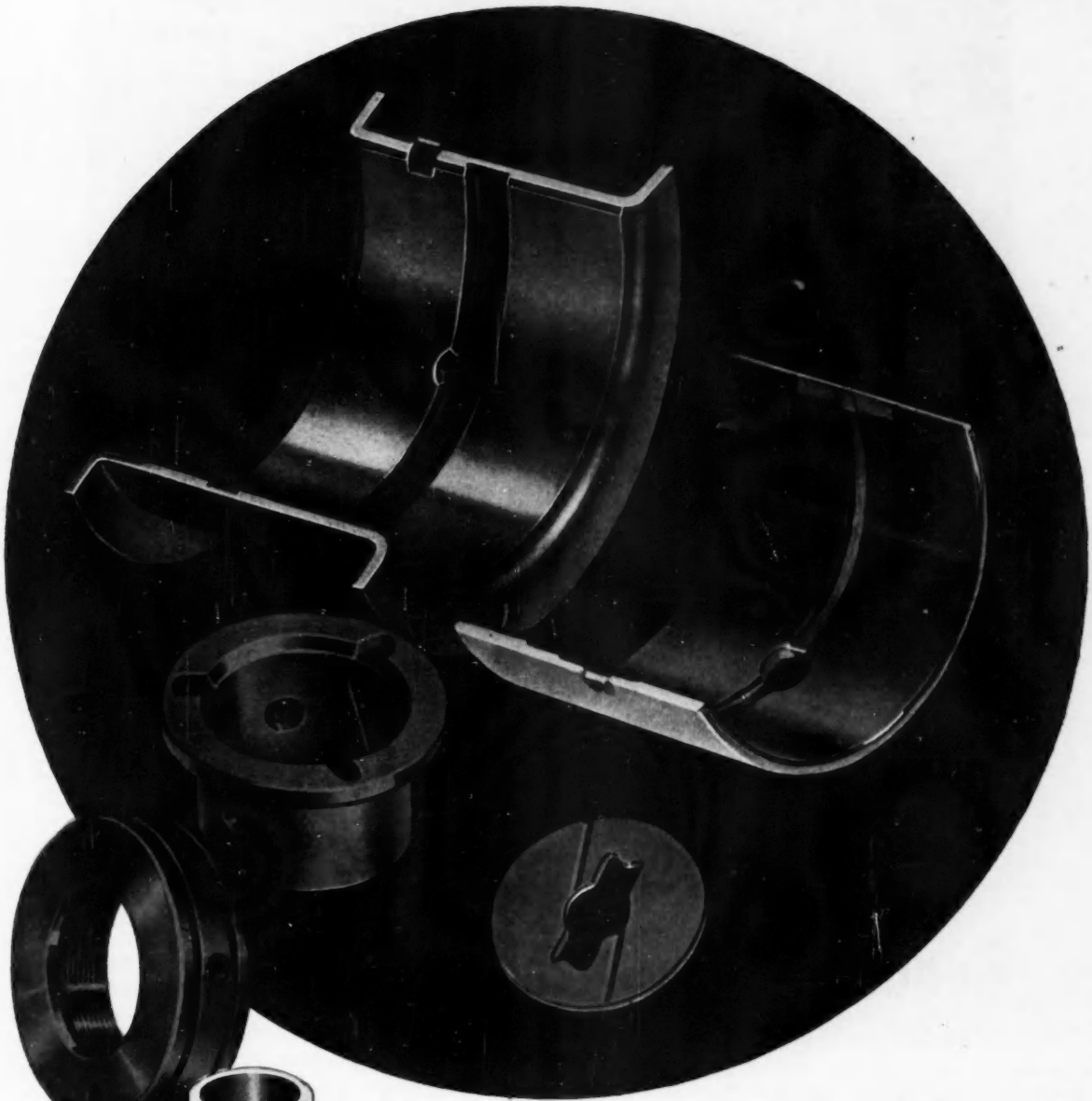
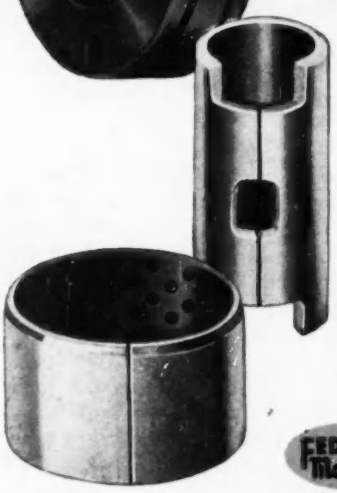
FOOTBURT

MACHINE TOOLS





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Perspective view of one of the numerous final assembly lines for power steering gear assemblies.

Power Steering Gear Parts Require Many Precision Operations

By Joseph Geschelin

ONLY a few months ago the Saginaw Steering Gear Div., General Motors Corp., placed in operation the latest unit of its expanding facilities—Plant 3, devoted to the manufacture of many parts and assemblies, including hydraulic pumps and valve assemblies for power steering gear. The initial article on this plan appeared in AUTOMOTIVE INDUSTRIES, May 1.

Parts manufacture requires a particular kind of equipment treatment due to the variety of parts and assemblies required to meet the specific needs of the customers. Not only does the parts maker have a variety of similar parts and assemblies but production lots are relatively small and must be scheduled in batches rather than repetitively. For maximum economy, consistent with lot production, the type of equipment best suited for such operations must have maximum flexibility and inherent quick changeover characteristics.

Plant 3 abounds in flexible equipment primarily, although there is a noteworthy installation of single-purpose Buhr machines of horizontal trunnion and vertical types, featuring multiple stations and multiple spindles. However, even the Buhr special purpose machines are so designed as to be capable of quick changeover for a family of similar parts.

The making of pump and valve parts for power steering gear is one of the most exacting precision operations to be found in the industry. Dimensional tolerances and character of surface finish are quite unusual, requiring not only special machinery and process but special attention to quality control. To meet these requirements SSG has inaugurated a system of statistical quality control throughout the plant, and employs a wide variety of special gaging equipment

such as the versatile Sheffield Precisionaire gages.

A quick perspective of the operation shows that precision grinding methods are among the most widely used techniques. Many of the operations are performed on horizontal double-end Besly grinders, including several oscillating machines and on No. 710 Besly vertical type grinders. At the present time the company has in use nine horizontal Besly grinders, and four vertical grinders. We understand that more of these units will come in later on.

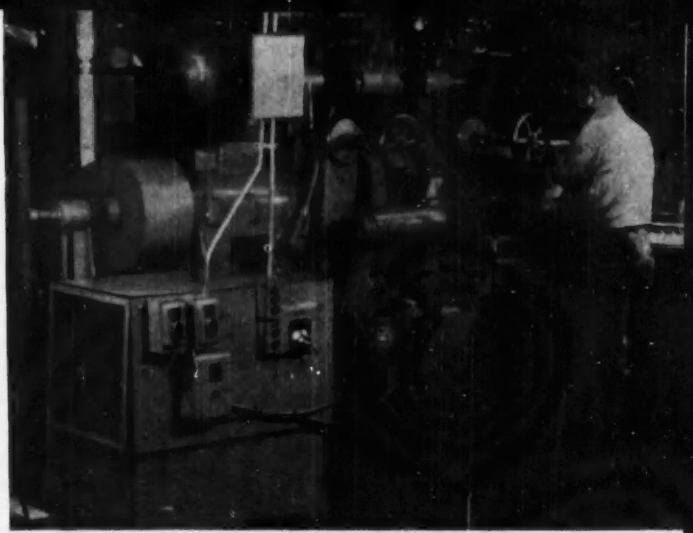
To be noted later are some interesting applications of Cincinnati Centerless grinders; and other types and makes of equipment.

Noteworthy example of precision work is the pump drive shaft, illustrated here. This stepped shaft is produced initially in an extremely intricate set-up on a large National Acme-Gridley multiple-spindle screw machine. The machine operator is provided with 22 different gages for checking the work. Incidentally, the threaded end is produced by rolling, this being a standard procedure at SSG.

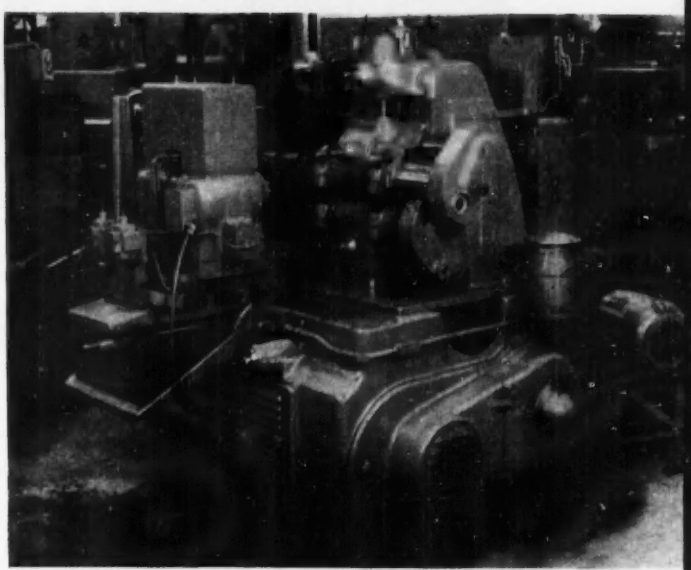
It will be noted that one of the diameters is held to a total tolerance of 0.0003 in., while the surface finish of the largest diameter is held to 16 microinch (rms). It is a matter of note that immediately after the part has been completed on the screw machine it goes to a special setup in a single Cincinnati Centerless Grinder where all of the stepped grinding is performed in a single cycle. This machine employs a special formed wheel, wheel dressing—a controlling operation in this instance—being controlled by means of an externally mounted cam. This will be recognized as an unusual example of centerless grinding. As a matter of fact, the development of the setup required considerable time and effort on the part of the master mechanic's department.

The vane pump ring involves some exacting operations. For example, the thickness of the ring must be held to a total tolerance of 0.0002 in., this being done by grinding in a double-end horizontal Besly grinder. In addition, the piece has an ellipsoid bore which is finished by grinding in a small Bryant internal chucking grinder, fitted with a special cam-and-follower mechanism installed directly on the work head.

The pump rotor is another intricate part, requiring a variety of unusual operations. Thickness must be held to a total tolerance of 0.0002 in., this being accomplished by grinding in a double-end horizontal Besly grinder, using an oscillating work fixture. A series of slots around the periphery are milled in setups on small Kearney & Trecker milling machines, the work being stacked on three

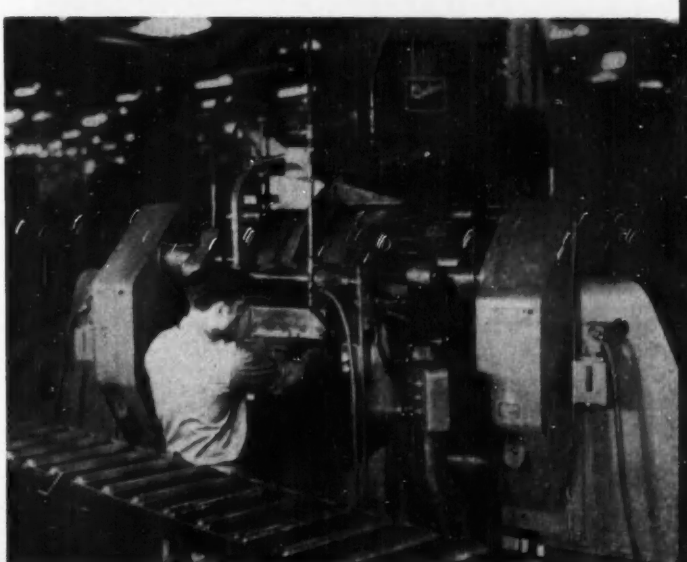


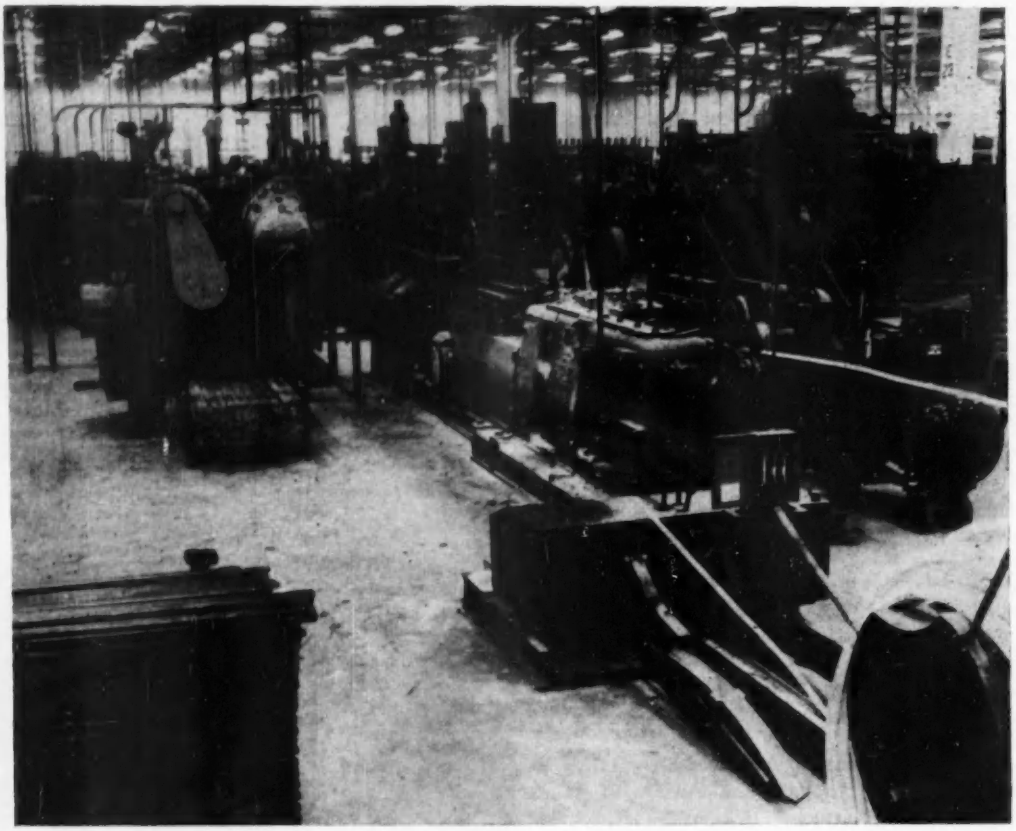
One of the many different types of Besly grinders used in the power steering gear plant. This one is a horizontal type unit fitted with an oscillating work-holding fixture.



Group of small Kearney & Trecker milling machines mentioned in the text. Each one has three work-holding spindles mounted on the head at the left.

Close-up of one of the special Buhr horizontal trunnion type machines installed in the machine shop.





Compact arrangement of equipment for producing steering shafts. The operation begins in the foreground with the feeding of coil stock into the Ajax-Hogue wire drawing attachment, proceeding through the Ajax straightening rolls and cut-off in the background. The Medart straightener shows in left background.

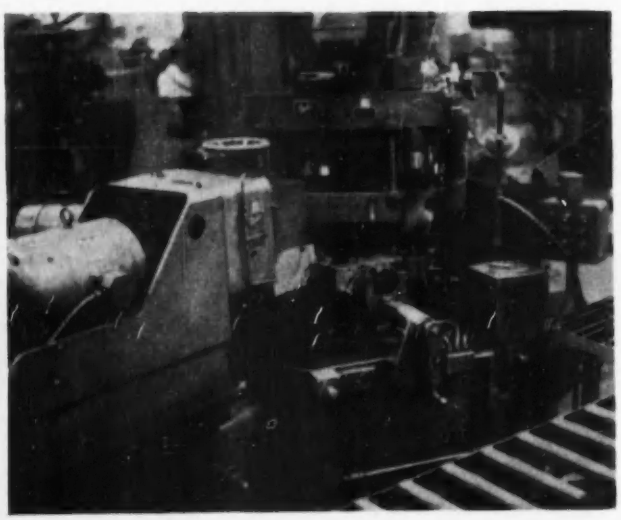
spindles. After heat treatment the slots are ground individually by plunge cutting on Thompson surface grinders.

It may be noted at this point that each of the machines in the battery of 10 Thompson grinders as well as the Besly grinders is provided with an individual Delpark unit which is used for filtering the coolant.

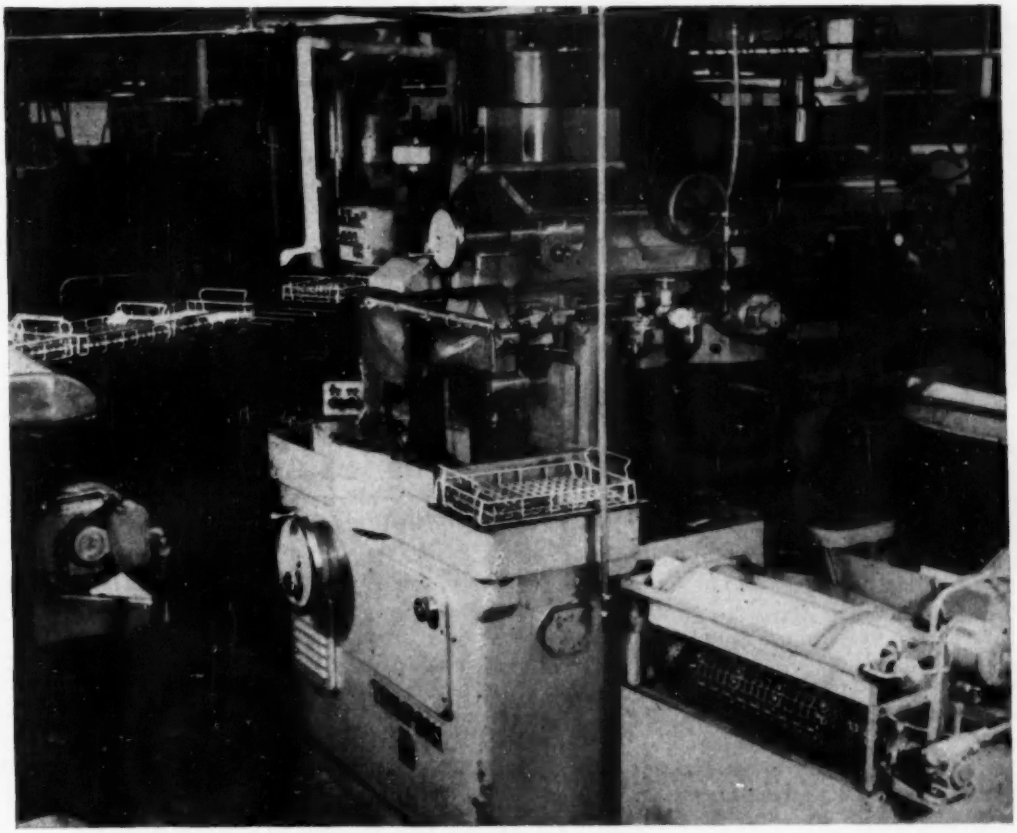
The small tool steel vanes for the pump require a large variety of special operations. Blanks are cut off to length in a small punch press, then subjected to heat treatment in a sequence of three Lindberg furnace operations. Minimum acceptable hardness is held to 62 Rc. The sides of the vanes then are ground —rough and finish—in Besly horizontal grinders, a special work-holding fixture. Two machines are employed for this operation, using hopper feed to maintain an output of 3600/gross/hr from each machine.

The ends then are ground to size and finish in Blanchard surface grinders. For this operation the vanes are loaded in special holders. Following this the ends are given a lap finish in a Norton Hyprolap while still retained in the holder.

The back edge then is ground in a No. 710 Besly vertical grinder. A feature of this machine is the provision of two large work-holding index fixtures. One fixture, loaded with the parts, is indexed under the grinding wheel while the other fixture is being loaded. This feature speeds productivity materially.



Close-up of one of the special multiple-head vertical Buhr machines on the pump line.

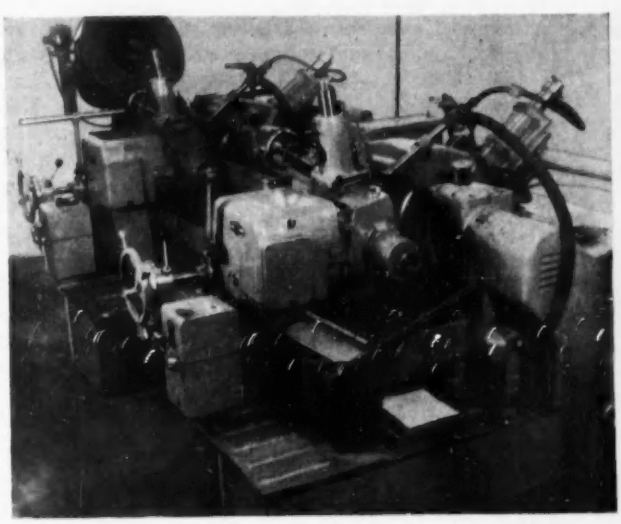


This is one of the Thompson grinders set up for finish-grinding slots in pump rotors. Slots are ground individually by plunge cutting. Each of these grinders is served by a Delpark unit for filtering the coolant which may be seen in the foreground at the right. Somewhat similar filters are used on the Besly grinders.

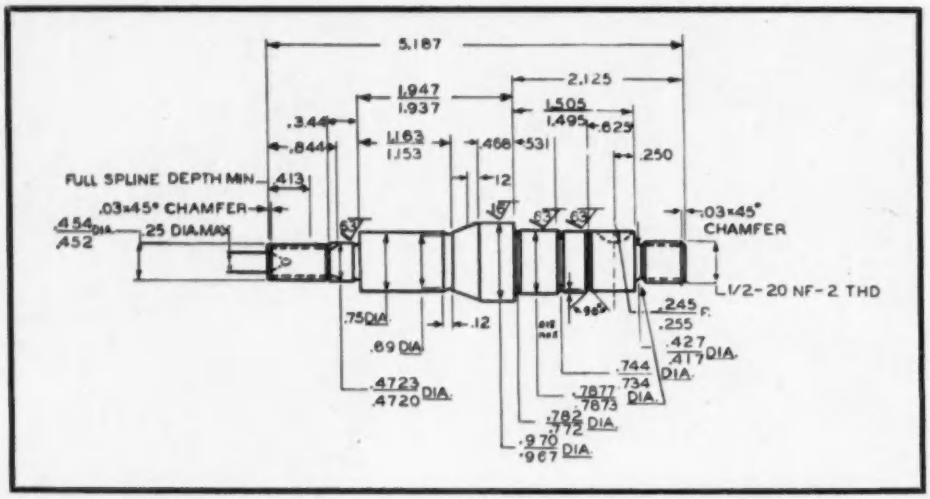
Finally the vanes are inspected and sorted in a unique and extremely fast operating electronic sorter designed and built by the Process Development Division, GMC. The need for an automatic and fast operating means of inspection is evident since thickness is held to a tolerence of 0.0005 in. while length is held to 0.0003 in. The sorter is designed to accept vanes within the specified tolerances, reject over- and undersize. Rejects are routed through chutes into suitable containers so as to facilitate their disposition. Oversizes can be readily salvaged by grinding.

Special Buhr machines are used for various operations on the pump body, pump cover, and valve parts. At the present writing there are 13 Buhr machines—of horizontal trunnion type as well as vertical type on pump parts; five on valves.

The pump cover, for one example, is routed first to a National Acme Gridley automatic for boring, facing, and counterboring. Then it goes to a Buhr for milling the manifold face; and drilling, reaming, and tapping holes in the manifold face. The second Buhr setup is tooled to drill four bolt holes, drill relief hole, center drill, drill and ream port holes; ream one bolt hole, spot face four bolt holes. The third Buhr setup mills the port face; counterbores and taps port holes; chamfers and recesses the center hole. Each of the setups takes a large number of parts on the work fixture, has a large number of spindles in operation, and



One of the numerous groups of Cincinnati Centerless grinders installed here. The hopper and magazine feed for these machines may be seen in the background.



Vane pump drive shaft, showing details of various stepped diameters.

in general performs the same kind of job as does a transfer machine.

The valve bore in the cover is precision-bored in a two-spindle, single-end Ex-Cell-O machine, three of these machines being installed for this operation. Then the bore is bearingized in a Hole Engineering machine to produce the final size and character of finish that is required. Three bearingizers are employed for this operation. Diameter of the bore is held to a total tolerance of 0.0005 in.; while surface finish is held to 32 microinch (rms).

The valve spool, the controlling element of the valve assembly, is machined from bar stock, carburized, drawn, then deep-frozen and redrawn. The grooves then are finish-ground to extremely close tolerances in a single operation on a new type of Sheffield crushed wheel grinder, using a suitably formed wheel for producing the grooves. Following this operation the OD of the lands is finished to a tolerance of 0.0001 in. on diameter. This is done in a battery of three Cincinnati Centerless grinders, connected by a common conveyor to make the operation entirely automatic from start to finish.

The small plungers used in the valve assembly are produced in automatic screw machines and heat treated. Then they are fed through a battery of Cincinnati Centerless grinders to finish-grind the OD to a tolerance of 0.0002 in., with surface finish of 10-microinch (rms). The grinders are interconnected with a conveyor, work being fed to the first machine by magazine from a hopper.

Length and squareness of the ends of the plungers also are held to close tolerances—total tolerance of 0.0005 in. on both dimensions. This is done by grinding in a Besly double-end horizontal machine with hopper feed to a large work-holding fixture.

One of the interesting features in this plant is a compact setup of equipment for making steering gear shafts. Conventional practice has been to machine these shafts directly from purchased bar stock. SSG has found considerable cost economy as well as improved quality in purchasing stock in the form of larger gage wire in coils, then drawing to size, straightening, etc.

For this purpose, SSG has installed an Ajax straightening machine fitted with an Ajax-Hogue wire drawing attachment at the entering end. The wire comes in about 53/64 in. diameter, is drawn to a standard diameter of ¾ in. This operation is more than drawing to size, since sufficient reduction is required to work harden the surface to a minimum of R_b85.

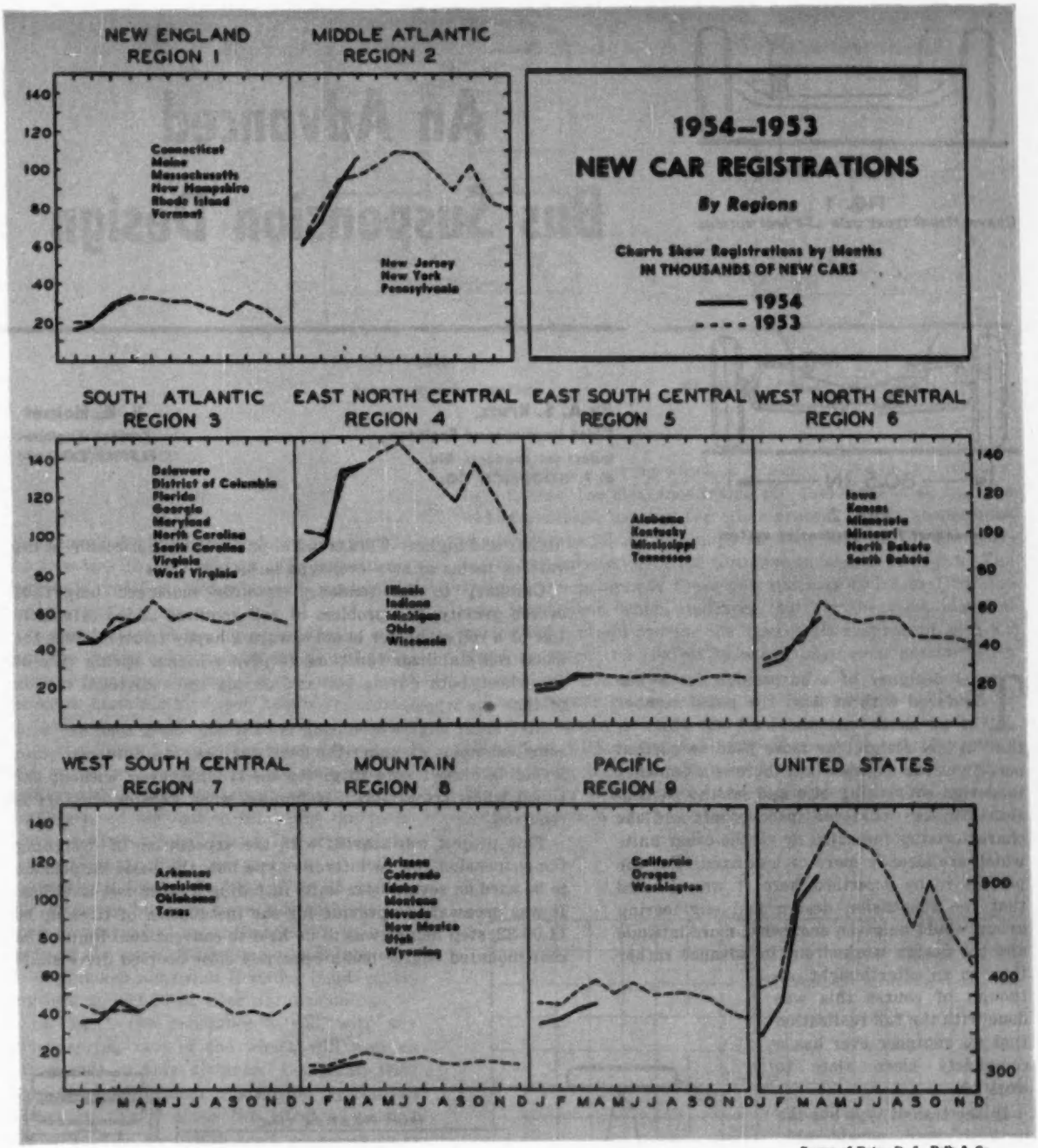
From the wire draw the bar continues through the long series of straightening rolls and is cut off automatically at the last station, cut-off length being held to a tolerance of 1/16 in. At this point the bars are discharged onto a short bar conveyor leading into a Medart straightener. Bars are pushed into the machine by means of an air cylinder mounted on the conveyor.

One of the largest single departments is the automatic screw machine department, featuring a battery of 74 multiple spindle screw machines of six- and eight-spindle type. Because of its self-contained character, the department has been treated to a chip disposal system to facilitate chip removal and salvage, as well as recovery of cutting oils.

Screw machines are arranged in two parallel rows and a chip conveyor is installed under the floor of each line. At the end of the line the inner conveyor unloads the chips onto a transfer conveyor which transports the chips to the outer conveyor and from this point on all chips move on a single conveyor. The latter discharges to a flight conveyor leading upward to a shaker, then to a crusher. The crushed chips are blown into a large hopper nearby for storing.

As the hopper becomes filled, the chips are loaded into a special container and held in this container before being centrifuged to remove excess cutting oil. The oil is collected in the basement gallery, filtered, sterilized, and stored for reuse. The chips, in turn, are transferred to the salvage area, after centrifuging, and held for loading into gondola cars or trucks.

Chips from other operations are given similar treatment, except for the fact that they are delivered to chip disposal area by industrial trucks.



Source of Data—R. L. Polk & Co.

GM Training Center on West Coast

Held recently were formal groundbreaking ceremonies launching construction of General Motors' West Coast Training Center, one of 25 now being built throughout the country. The network of centers is being set up by GM for instructing the mechanics of its passenger car and commercial vehicle dealerships in the technological advances in GM products.

The San Leandro Training Center will have an area of more than 29,000 sq ft and eight specialized shop class rooms for Chevrolet, Pontiac, Oldsmobile, Buick, Cadillac, GMC Truck, Fisher Body and United Motors Service. In addition, a ninth room will be shared by the Euclid, Allison and Detroit Diesel Engine Divs.

Square D Starts Expansion Plan

As part of its new expansion program, Square D Co. will construct a new 60,000 sq ft manufacturing plant and regional sales office in Royal Oak, Mich. To be located on a 19-acre site in the Detroit suburb, the plant will cost about $750,000. Since the end of World War II, Square D has spent $10 million on expansion programs.

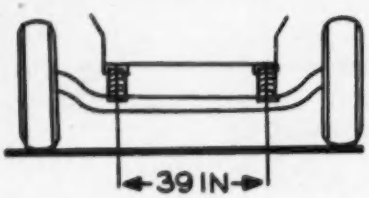


FIG. 1
Conventional front axle and leaf springs

An Advanced Bus Suspension Design

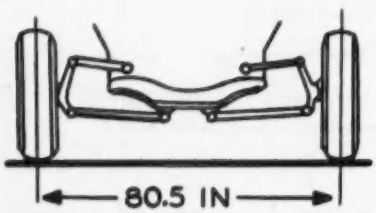


FIG. 2
Independent front suspension system

By A. S. Krotz,
Chief Development Engineer
Industrial Products Div.
B. F. GOODRICH CO.

R. E. Houser
Project Engineer
FLXIBLE CO., and

THE designer of a suspension for a bus is faced with at least the usual number of problems, not the least of which is that in bus design, far more than in current passenger car engineering, there is a tendency to design everything else and let the suspension man use whatever space is left and the characteristics indicated by all the other units which are already more or less fixed. For the project to be described here it was decided that the suspension design and engineering group would be given somewhat more latitude and the design worked out in advance rather than as an afterthought, although of course this was done with the full realization that no engineer ever has a completely clean slate to work on.

In the transit type bus the payload may considerably exceed the empty sprung weight of the bus. While the intercity bus is less difficult in this respect, considerably greater comfort is required of the intercity bus, step level must be held within fairly restricted limits on both types, and there has been a disquieting tendency for several years for the center of gravity of the intercity bus to be placed higher and higher. This trend is particularly noticeable in the various forms of two-level type buses.

Corollary to the tendency towards increased height of center gravity, the problem of roll requires added attention. Use of a roll stabilizer is not always a happy solution since the usual roll stabilizer functions to give a higher spring rate at the wheel, both during roll and during the individual motion of that one wheel.

Since rear engine mounting is so widely used, together with some examples of under-the-floor engines, the universal joint layout is almost sure to give some trouble, even without the added wheel travel which is implied when greater comfort is required.

This project was started with the expectation of designing the suspension for an intercity type bus, the basic suspension to be used on several size units including a large two-level bus. It was necessary to provide for the installation of tires up to 11.00-22, step height was to be held to conventional limits, the rear mounted engine has a relatively close coupled drive shaft

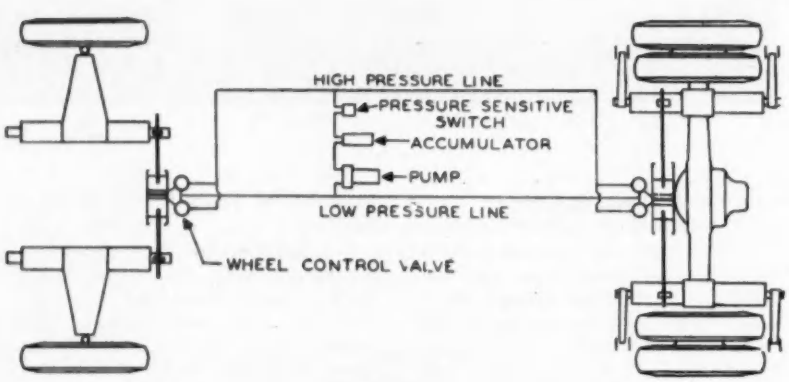


FIG. 5
Schematic drawing showing design of constant level device

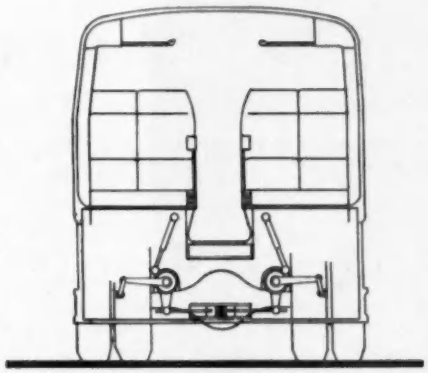


FIG. 3

Rear suspension system

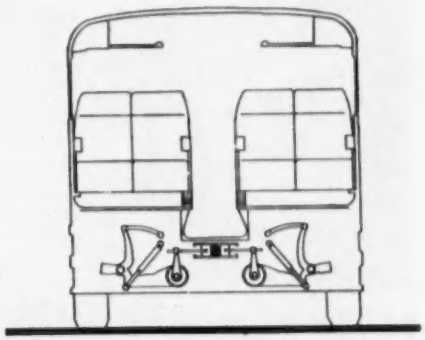


FIG. 4

Geometry of front suspension system

J. H. Kramer
Development Engineer
B. F. GOODRICH CO.

which implied high universal joint angle and the bus was to be made to give an unusual degree of comfort, security and roadability for intercity operation.

It was decided at the inception of this work that the logical solution was the use of independent front suspension and a constant level device to maintain designed height regardless of load. This conclusion seemed self-evident after considering that softer ride, reduced roll and added roadability were all required, together with a high center of gravity, fairly high ratio of payload to total and the insistence on conventional limits for step height.

Considering first, the problem of roll, a conventional front axle for a 37 to 45 passenger intercity bus will have conventional leaf spring pads spaced approximately 39 in. apart in front elevation. This dimension might even be diminished somewhat if 45 deg inside steering lock and 11.00-22 tires are demanded.

In Fig. 1, the resistance to roll, with any given spring rate of the wheel, will vary as the square of this distance. Compared with this, the independent suspension system as shown in Fig. 2 gives the effect of placing the springs in the wheel track plane which is a spacing of 80.5 in. The relation of the squares of these two spacings is 4.25 to 1, indicating that with identical wheel rates the independent suspension would produce four and a half times the roll stability. The actual geometry used for the wishbone type front suspension is shown in Fig. 4.

For the rear axle it was decided to use the type of suspension already in production since 1946 on a transit type bus. This is shown in Fig. 3, where the outer shells of rubber torsion springs are mounted on the axle housing and the spring shaft carries a torque arm at each end of the spring which is shackled to the body structure. In this case, the clearance inside the dual tires is 46 in. The widest practical spacing for other present spring suspensions would then be 36 in., as compared with 61½ in. for the spacing of the outer ends of the torque arms shown in Fig. 3. The ratio of the squares of these two spacings is 2.9 to 1 for the rear suspension, which indicates that for the rear, identical spring rates would provide the Torsilastic suspension with 2.9 times as much roll control as would have been possible with conventional leaf spring.

The inherent roll resistance of this system is obviously so high that spring softness can be determined from other considerations without the possibility of excessive roll. Therefore, the criterion used was the maximum wheel stroke permitted. We have for a long time been prejudiced in favor of large wheel strokes, a prejudice which has not always been shared

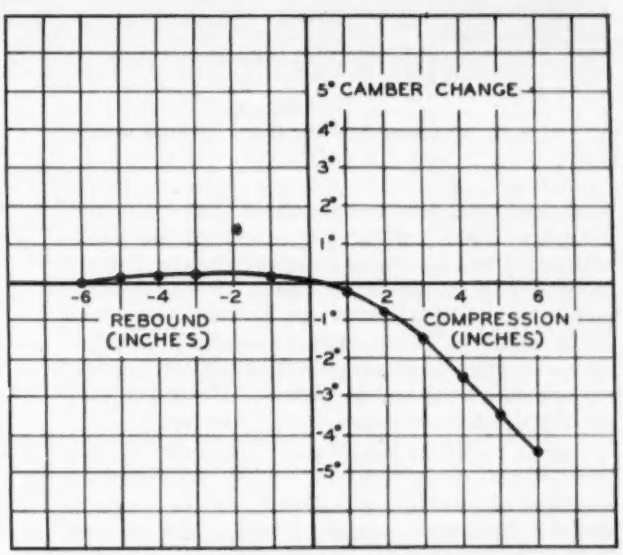


FIG. 6

Front wheel camber change during compression and rebound

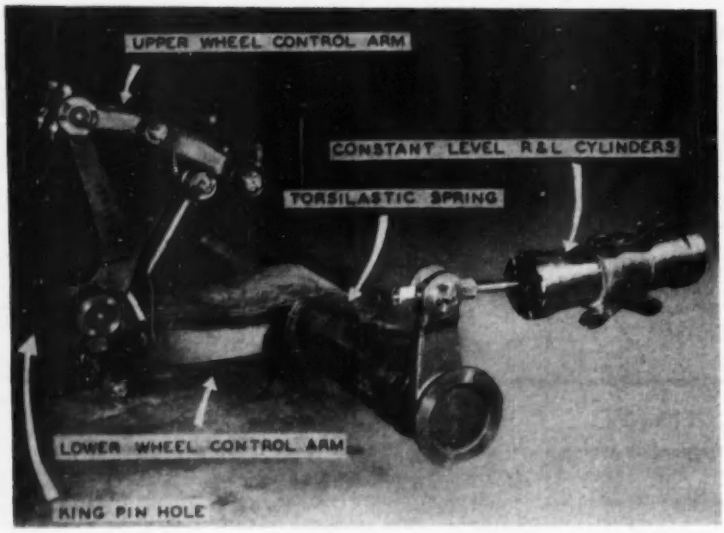


FIG. 7
Front suspension units

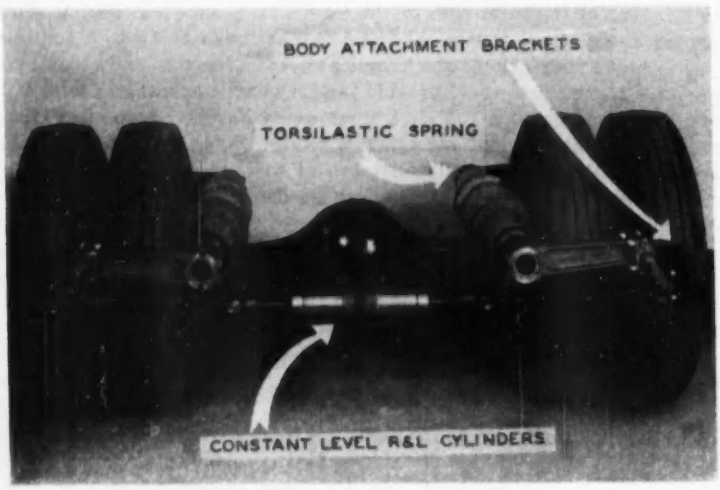


FIG. 8
Components of the rear suspension system

by the universal joint makers and the men responsible for other chassis details. Also, as the spring rate is softened it becomes necessary to increase the "breathing action" or stroke of the wheels. After some difficulties were ironed out it was decided that a total wheel stroke of 12 in. could be tolerated, based on metal-to-metal interference, also based on bumpers engaging at least 1½ in. before the metal-to-metal position for both rebound and compression.

This preliminary analysis aided in deciding whether to use constant level or not. It was decided that a maximum change in step height of 2¼ in. would be accepted. Taking this change in height from the total of 12 in. travel left 9¾ in. for the entire dynamic wheel stroke, assuming that no constant level was used, and this was divided to give 4¼ in. rebound from empty or 2¾ in. until minimum bumper contact, and 5½ in. compression from loaded to metal-to-metal or 4 in. to minimum bumper contact. Of course, with constant level there would be 6 in. available in either direction at all times and somewhat higher and softer bumpers could be used.

With the above preliminary work the question of spring rate was decided on. The weight distribution on this bus was as follows:

	Front	Rear	Total
Gross Empty (lb)	6143	12558	18700
Unsprung (lb)	941	2147	3118
Sprung			
Empty (lb)	5172	10411	15582
Pay Load (lb)	2204	4270	6473
Per Cent			
Pay Load	34%	66%	100%

Returning to the decision as to spring rate, since 2.25 in. change in height with pay load was to be maintained, and assuming, first that the spring rate is uniform, we would be committed to 490 lb per in. for each front wheel and 950 lb per in. for each rear wheel. This, in turn, when divided into the sprung empty loads, represents 5.3 in. nominal deflection in the front and 5.35 in. for the rear. Rubber springs were to be used because of the lowered noise level, reduced harshness and reduced maintenance which they make possible. However, one characteristic of rubber springs is that they are dynamically somewhat stiffer than indicated by static deflections. For the type of spring and rubber under consideration this difference amounts to about 30 per cent, that is, the springs being dynamically 130 per cent of their static rate. Applying this ratio to the 5.3 in. nominal static deflection indicates that dynamically the nominal deflection would be only 4.1 in.

Using this dynamic deflection in the equation $f = \frac{188}{\sqrt{d}}$, this would result in a theoretic vertical frequency of 92.5 per minute. It was decided that this was too stiff to be acceptable for the type of bus under discussion. It was found that we could improve the rear by taking advantage of the variable rate effect of the special suspension linkage used. No such improvement could be made at the front and it became obvious that the greatest possible nominal dynamic deflection for the empty bus without constant level

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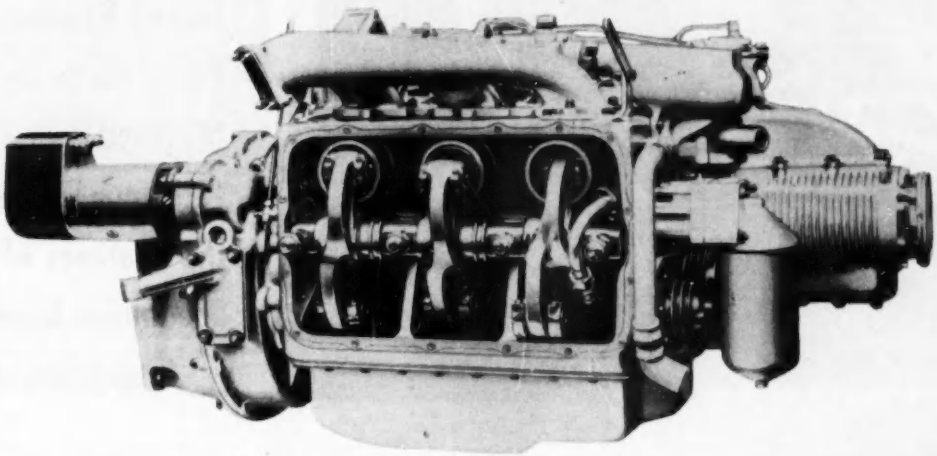
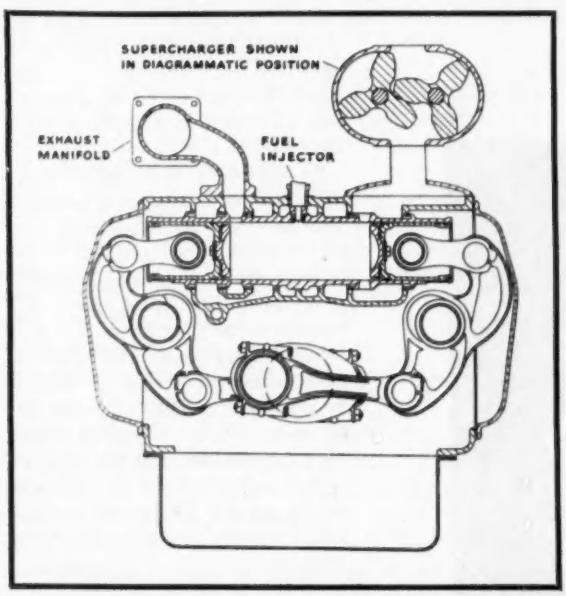
Britain's First Opposed Piston Two-Stroke Diesel



Commer opposed-piston two-stroke direct-injection Diesel. Right cover is removed, showing rocker assembly.

FOLLOWING seven years of development work, Commer Cars, Ltd., Luton, has introduced Britain's first opposed-piston, two-stroke Diesel for commercial vehicle application. The new TS3 engine has three horizontal cylinders each with two pistons, and develops 90 hp at 2400 rpm. Bore and stroke are 3.25 in. and 4 in., displacement 199 cu in., and effective compression ratio 16 to 1.



Cross section of the opposed-piston two-stroke Diesel, showing cylinder liner with surrounding water jackets, pistons, and rocker arms linking each pair of connecting rods.

Each piston is coupled to the six-throw crankshaft, centrally placed below the cylinders, by a pair of connecting rods linked by a vertical rocker arm. At the end of the compression stroke in each cylinder the two pistons are at inner dead center. The dish-shaped recesses in their heads combine to form the combustion chamber directly beneath the injector.

During combustion, both pistons move outwards on their power strokes. Near the completion of this stroke exhaust ports at one end of the cylinder liner wall are uncovered by one piston, and burned gases start to escape.

Inlet ports at the other end are uncovered by the second piston after a further 25 deg rotation, releasing air compressed in the inlet manifold chamber by the Roots type blower. Air then rushes through the barrel to effect uniflow scavenging. On the inward travel of the pistons, exhaust ports are closed slightly ahead of the inlet ports to permit a small additional build-up of air.

Cylinder block and crankcase are integral, with wet cylinder liners pressed into the iron casting. Liners are sealed by flexible metallic lips machined in their outer diameters. Two-piece pistons combine a heat-resistant steel head and a cast iron body.

Head and body are separated by heat insulating spacers, giving hot head operation which assists combustion. High thermal efficiency is claimed to result also from the absence of cylinder heads which normally conduct heat away from the combustion zone,

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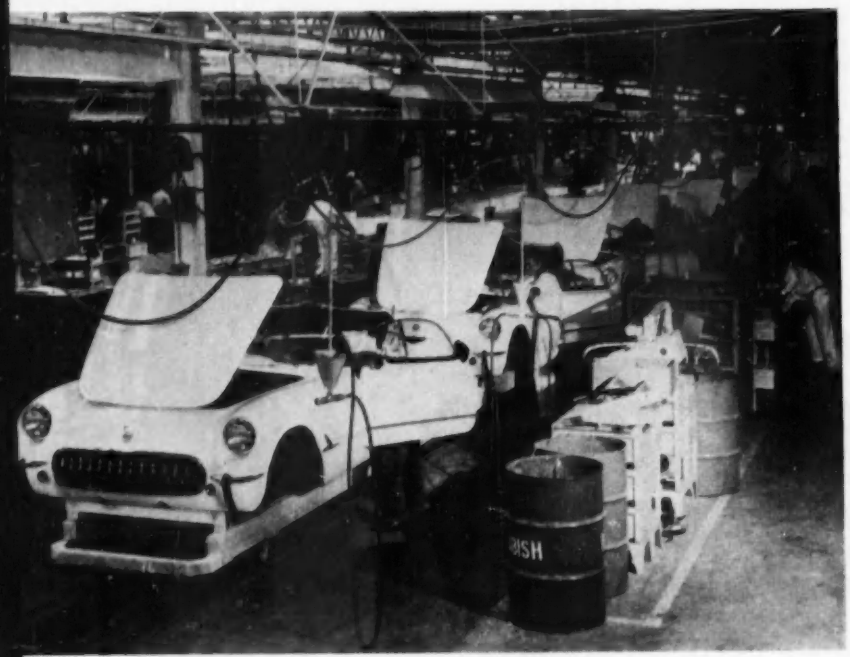


Here are Corvettes on the trim line nearing the body drop.

Refinements in the Handling of Reinforced Plastics and Parts Made by the Matched Metal Die Technique are Among the Features of this Specialized Assembly Establishment

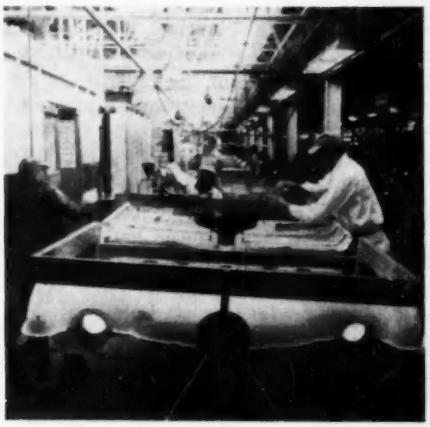
Improved Methods Accelerate

By Joseph Geschelin

JUNE, 1954, marked the turning point in Corvette production. During the course of a news conference at the Chevrolet assembly plant in St. Louis, it was disclosed that by the end of that month Corvette production would be at the rate of 50 per day. Last fall (see AI, November 1, 1953) Chevrolet released for the first time the details of Corvette plastic body production—a closely guarded technique up to that time. Today the St. Louis plant represents the first mass production sports car plant of its kind in the USA, geared to 1000 units per month. (Early in July Chevrolet readjusted its production schedule temporarily to 300 Corvettes a month.—Ed.)

In attaining this goal Chevrolet not only created a specialized assembly establishment for the building of plastic body cars, it has also developed many refinements in the handling of reinforced plastics marking logical advances over the earlier procedures pioneered at Flint. By far the major stimulus to volume production stems from the progress that has been made in the molding of reinforced plastic parts. Paying off on the promise made last year, the cus-

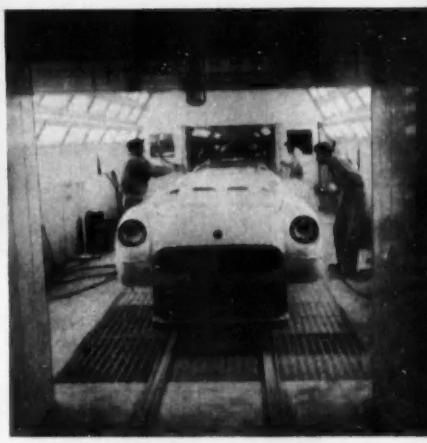
Body drop carries finish-trimmed bodies to the chassis assembly line reaching to left in background.



Corvette assembly starts with the underbody, largest of the 62 plastic sections that comprise the body. Here the underbody is placed in the buck for assembly of reinforcements before starting its trip on the body assembly line in the background.

Next, Corvette shell takes shape as it moves along the line where the various sections are bonded and riveted together. At this stage trunk lid hinges are in place and small clamps hold the bonded upper and lower body halves.

Interior of one of the large Mahon paint booths where bodies are given their prime and finish coats. A powerful downdraft carries overspray through the floor grating and out in a cascade of water.



Corvette Production

tom molding source at Ashtabula now has converted all molding operations to the so-called matched metal die technique. Every one of the 62 moldings made for the Corvette body—with the exception of the large underbody structure—was being produced by this method by mid-June.

Corvette assembly, compressed in the compact 200 by 500-ft area devoted to this operation, begins with the underbody. Using a large reinforced plastic fixture, 180 holes of various sizes are drilled in the underbody to facilitate assembly operations. Because the grinding and polishing of plastic results in a considerable amount of dust the preparation of surfaces and edges as well as the scuffing of all bonding areas is done in a large Mahon booth, provided with downdraft exhaust and a water cascade under the floor to remove the dust. The same procedure is followed on other major parts, thus eliminating much of the dust from the assembly floor.

As underbodies are removed from the booth they are mounted on a buck and have the various reinforcements riveted in place. Then the underbody is securely fastened to the assembly truck and placed on the power driven assembly conveyor. All assembly operations begin with the underbody as the backbone.

In similar fashion, the rear end sub-assembly is prepared at another station; the front panel is ground and scuffed in a Mahon booth, and the front end subassembly completed on a buck before transferring it to the assembly line. It may be noted that bonded joints on all parts are scuffed, as mentioned earlier, the scuffed areas then being given a coating of a special adhesive, applied manually.

In addition to the handling of large sections in the booths, the various small parts also are ground and scuffed in a Mahon booth in preparation for assembly.

As the various plastic parts and sub-assemblies are completed at their several stations, they are transferred to the assembly line where the plastic hull is integrated. Since the St. Louis operation has more of the aspect of mass production, a number of important details have been added to facilitate body assembly. For example, special metal gates have been provided for checking controlling openings such as the doors, hood, and trunk lid. In addition, there is an inspection gage—similar to a gate—for checking the grille opening. The various gate fixtures are employed to check the openings before the sections are finally cemented together.

Along the line is a station for doors, just prior to door hanging. Here the doors are assembled and fitted with the necessary hardware.

While the plastic hull proceeds smoothly along the assembly line, operators are engaged in grinding and polishing the exterior cemented joints and surfaces to produce smooth surfaces suitable for painting. Activity along the final stages of body assembly may be likened to the body-in-white-line. Here are found

the many details of fitting and repair in preparation for paint. Where minor surface defects may appear occasionally the operators repair them with clear plastic so as to match the exterior color.

When bodies reach the end of the line they go into a steam room. Objective is to remove all dust as well as minute particles of wax lodged in the plastic surface. Steam cleaning prepares the surface admirably for painting. This is followed by dry-off in an oven, the bake also assisting in the curing of bonded joints.

Bodies now are ready for the prime coat, applied by spraying in a Mahon water-back booth. They are then put through a drying oven. It is of interest that the main oven in this area is a wide unit of four-track design, held at a temperature of 140 F, served by Mechanical Handling System conveyors.

One of the features of the department is an extensive wet deck for wet sanding of bodies. Since it is employed for bodies in white as well as in prime, both kinds will be found on the line at the same time.

Finish painting is done in another spray booth. At the present time Corvettes are being finished either in white or blue, the latter being an innovation at St. Louis. After the finish coat has been dried, the bodies are polished prior to installation on the chassis.

Bodies now are ready for the trim line. Unlike conventional assembly, the trim line requires installation not only of seats and upholstery but the radiator, wiring harness, steering mast, and many accessories as well. Fabric tops also are installed—in raised position. The compact trim line comprises about 18 stations.

Paralleling the trim line is chassis assembly. Before starting on its course, the frame is laid upside-down on a buck to facilitate installation of front and rear suspensions as well as the rear axle. Then it is turned over and mounted on the chassis line.

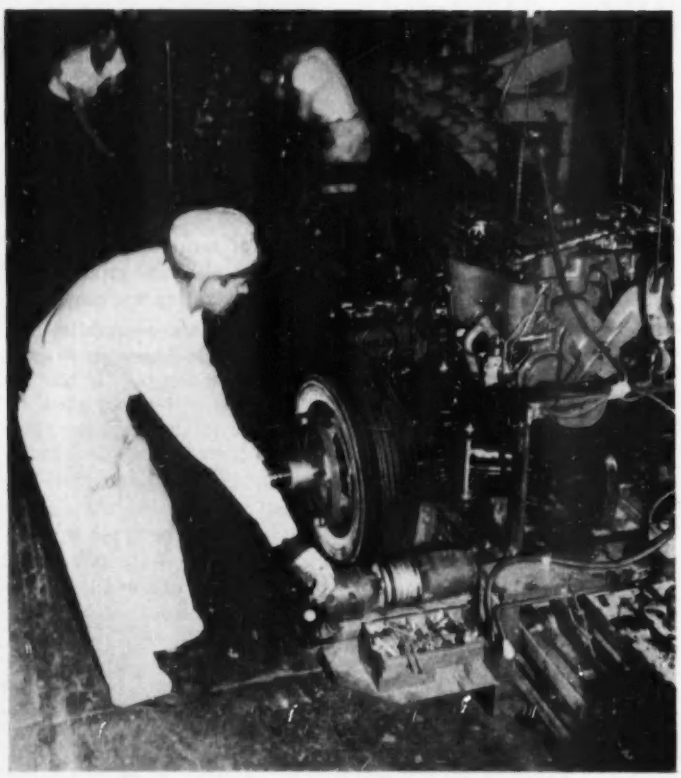
Corvette engines, minus accessories, are shipped to St. Louis from Flint. They go immediately to a dress-up line for installation of accessories and attachment of the Power-Glide transmission. Then they are given a 30-minute dynamometer run on one of three test stands. Before the run is completed, the skilled mechanics synchronize the three carburetors, adjust valve lash and ignition timing, check the transmission for operation and noise. In fact, everything is done to make the powerplant ready for driveaway.

An unusual feature on the final line is one of the first installations of the Hunter Engineering Co., wheel balancing machine. Mounted on a fixture extending across the power driven assembly conveyor and riding with the chassis, the wheel balancer has a station on each side, permitting the balancing of two wheels at a time. The wheel and tire assembly is driven at high speed by the motorized attachment, location and amount of weight compensation being read from a dial.

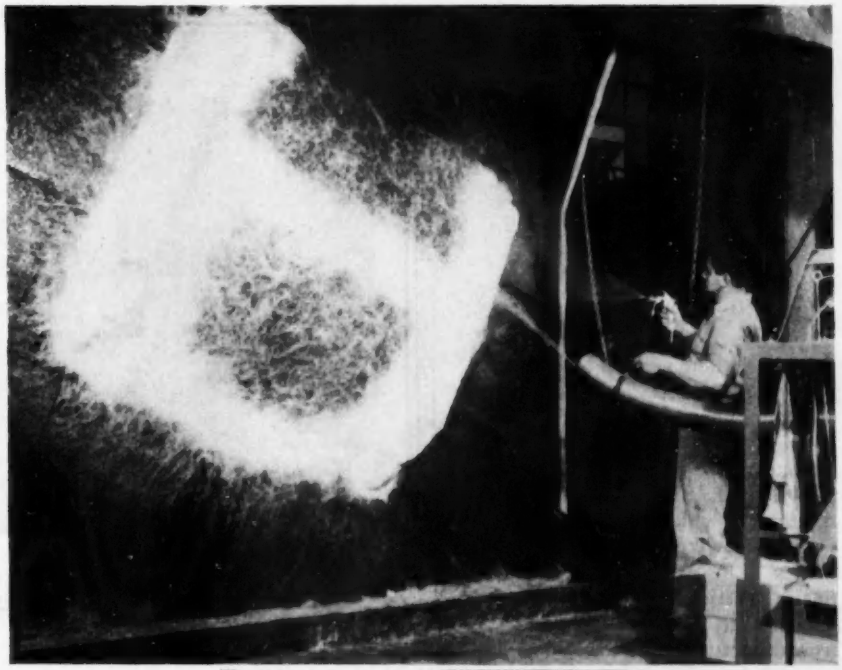
At the end of the assembly line the Corvettes are driven off under their own power and given a short run around the grounds.

As mentioned earlier, certain refinements and simplification have been effected at St. Louis. Previously it was necessary to manually route large square or rectangular profiles in various sections. After serious consideration it was found that smaller circular holes would do just as well. Not only did this eliminate time-consuming manual routing operations, it also resulted in stiffer sections at these points.

It was mentioned too that every molding except the underbody now is made by the matched metal die technique. It may be noted that work is under way on the underbody as well and this should be released for production soon. Principal advantage of this new technique is to speed up the molding process and reduce the time-consuming operations employed heretofore. Even so, the molding of reinforced plastics takes time and equipment and a large amount of floor space, and by no means approaches the speed necessary for mass production as it is

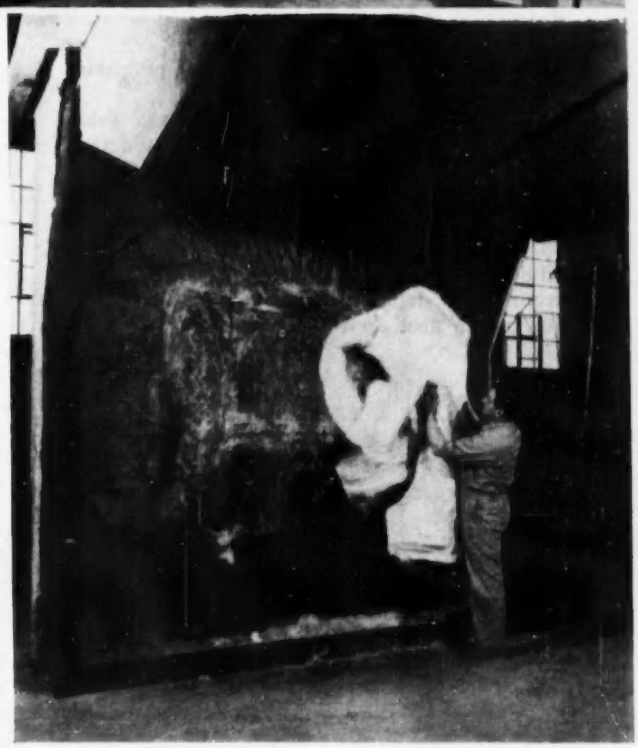


Close-up of a Chevrolet "first"—installation of Hunter wheel balancing equipment right on the chassis line. The high speed motor drive seen here spins the wheel for balancing, the fixtures mounted on the outside of the wheel providing readings of out-of-balance location and weight connection.



Right—
Last word in reinforced plastic molding—first stage of matched metal die process. The large disk seen here holds a metal screen shaped to the formation of a given part. Chopped fiber glass, fed from a hopper at the right, is blown from the large tube held by the operator, impinging on the screen. Behind the screen is a powerful suction that holds the fibers securely in place. While the fibers are being blown onto the screen, the operator may be seen spraying the mass with liquid plastic to bond it together.

Below—
After the suction is shut off, the operator simply strips the loose mass of plastic-impregnated fiber glass from the screen. This loose blanket then is fitted into the steel mold, serving as the base for further plastic impregnation and final curing under heat and pressure.



recognized in the automotive industries.

St. Louis has made great forward strides in the development of Corvette production. But it is recognized that plastic construction still has a long way to go to compete with steel bodies where large volume of production is required.

On the other hand, Chevrolet has pioneered something new and has found the solution for many problems considered almost insuperable only a year ago. Corvette production is bound to give the reinforced plastics industry a big lift. For example, it takes about 400 lb of material on the average for a single hull. Considering present schedules, with Corvettes being built at the rate of 1000 a month, there is a requirement of 12,000 bodies a year. That creates a demand for a minimum of 4,800,000 lb of plastic and glass fiber yearly for Corvette alone.

• • •

Buick Turns Out 2000th Jet Engine

In September, 1952, Buick turned over its first Wright J-65 jet engine to the Air Force. Last month, the 2000th Buick-built engine, a highly improved version of the original power plant, was accepted by the Air Force.

Used in Martin B-57 bombers, Republic F-84-F Thunderstreaks, and a new fighter presently undergoing tests, the J-65 is rated as one of the most powerful jet engines in the world. It weighs about 2500 lb and is in the 7200-lb thrust class, equivalent to 13,000 hp at high speed. Buick is building the engine under a license agreement with Wright Aeronautical Div. of Curtiss-Wright Corp.

Buick is assembling the jets in a giant dual-purpose plant in Willow Springs, Ill. Bulk of the machining operations on the J-65 are being performed in Flint, Michigan.

Prospects For

Small Industrial Gas Turbines

By HENRY C. HILL
Boeing Airplane Co.

In spite of the many favorable characteristics ascribed to the gas turbine engine, and the very considerable amount of development work already done, no one is in a position to supply this new type of prime mover to replace the piston engines in tractors, or bulldozers, or even to discuss deliveries in the near future. The exact realm and future position of the gas turbine is still, therefore, a controversial subject. There may be a tendency to write off the gas turbine as something for the misty future when numerous technical problems will have been resolved.

Following are descriptions of some of the field experience obtained with the Boeing engine and the current engineering effort toward improving the competitive position of the gas turbine.

Two hundred and fifty of the Model 502-2 engine with 175 hp rating and weight of 230 lb have been built and delivered for military use in the U. S. Navy. These engines are doing a very creditable job. The first units put in fleet service are exceeding the 350 hour first overhaul time which was originally planned.

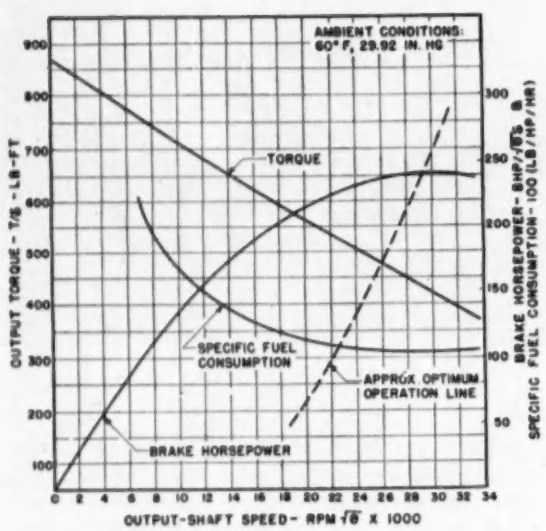

AMBIENT CONDITIONS: 60° F, 29.92 IN. HG
TORQUE
SPECIFIC FUEL CONSUMPTION
APPROX OPTIMUM OPERATION LINE
BRAKE HORSEPOWER
OUTPUT TORQUE - T/S - LB-FT
BRAKE HORSEPOWER - BHP/(δ/σ)
SPECIFIC FUEL CONSUMPTION - 100 (LB/HP/HR)
OUTPUT-SHAFT SPEED - RPM √θ X 1000

FIG. 2

Brake horsepower, output torque and specific fuel consumption of the Model 502-10 gas turbine engine

Figure 1 shows the 502-10 model which is a further development of the 502-2 engine, with pressure ratio increased from 3½ to 4½, and the continuous output increased to 240 hp. The weight has increased to 280 lb. This model has been in the test laboratory for the past year, and small numbers have been built for experimental service use. Although this engine is quite similar in appearance and design arrangement to the 175 hp model, there is an improvement in fuel consumption of 20 per cent. Horsepower, torque, and fuel consumption are shown in Fig. 2.

Following are most of the installations with which Boeing has had experience:

Navy personnel boat—first gas turbine installation.
Navy Kaman helicopter.
CESSNA L-19 Army liaison airplane.
XT-50 engine for L-19 (on test stand).
Army Engineers pipe line pump set.
Sixty kva 400 cycle generator set.
Portable air compressor unit.
Twin unit air compressor cart for B-52 airplane.
Army Ordnance 6 x 6, 2½ ton truck.
Switching locomotive twin turbine power pack.
Kenworth motor truck and trailer.

From a variety of these jobs all done with the same basic Model 502-2 engine, it is clear that the small gas turbine is a versatile performer. This characteristic of the gas turbine is an indicator that the potential field of application is very broad indeed.

The favorable qualities which are responsible for this demonstrated versatility may be summarized as follows: Less noise; much better smoothness; ideal torque characteristics; almost complete elimination of cooling requirements; good flexibility of control; ability to operate on much more lenient fuel and lubricant specifications; and small size and light weight.

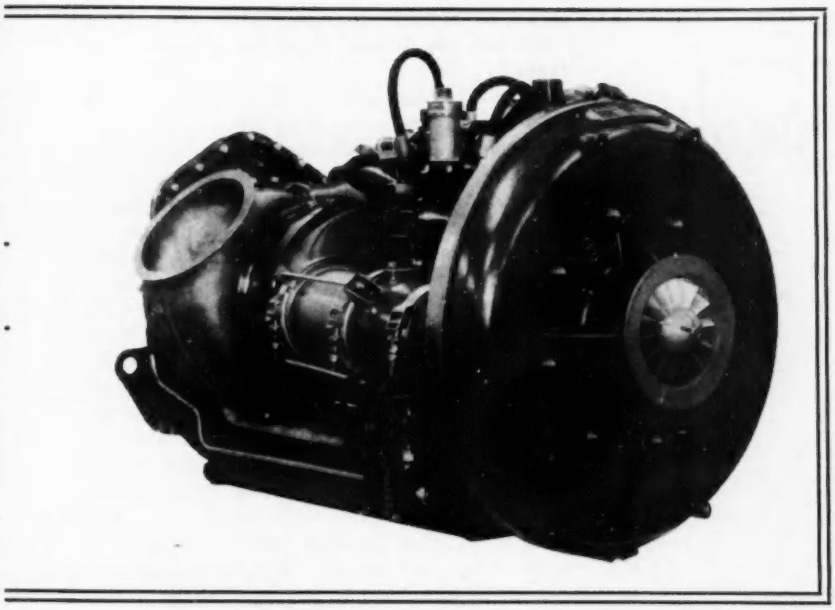


FIG. 1
Boeing Model 502-10 gas turbine engine

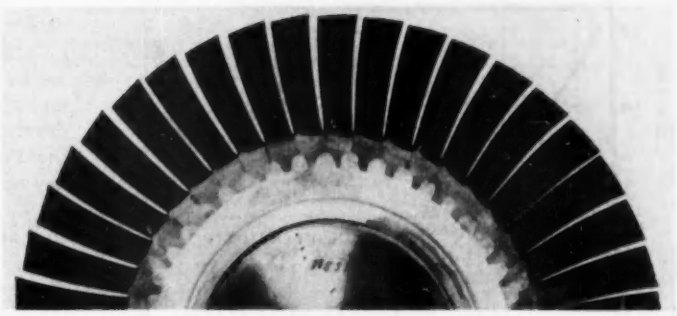
All of this installation testing has well established the advantage of the "free" output turbine wheel construction pioneered in the Boeing engine. This arrangement, sometimes called the two-shaft turbine, provides torque converter characteristics by having the output turbine independent of the gas producer turbine. Starting has proved to be dependable and quick, and throttle response adequate. Use of the lower grades of Diesel type fuel has been found practical. Performance at altitude has been found unusually good.

Now in spite of all these good features, commercial demand has not developed. Even for military uses the quantities ordered have been mostly in small lots and for specialized applications. The principal reasons for this present lack of demand are high manufacturing cost, high fuel consumption, and uncertainty on reliability and life expectancy.

Engine reliability and life were chief concerns over the past two years during the installation trials just described. A large amount of engineering effort has been expended in determining the causes and corrections of erratic engine behavior, power losses, and lack of consistency between engines supposedly identical. Mechanical failures of turbine blades, turbine nozzles, compressor wheels, burner liners, gas seals, spark plugs, and shaft bearings have occurred during the 15,000 hours of test stand endurance running. Progress in eliminating these troubles has been extremely rapid compared to initial progress on piston engines.

Of particular importance to the future of gas turbines has been the success in improving the life of turbine wheels and blading. Boeing is confident that satisfactory life of turbine wheels can be provided with complete operating dependability. Means have been found to overcome all of the troubles, including the following:

(1) Development of safety factor against wheel burst.
(2) Elimination of wheel rubs from blade stretch, shroud ring distortion and end movement of hot parts.
(3) Elimination of blade base and blade airfoil failures from vibration fatigue, thermal shock cracks, and stress rupture.
(4) Control of starting and acceleration overheating.



Welded type turbine wheel (above)
Fir tree type turbine wheel (below)

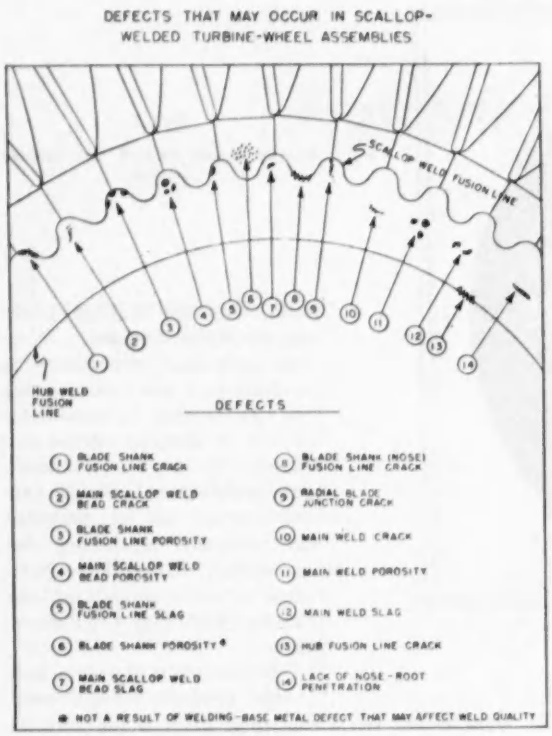

DEFECTS THAT MAY OCCUR IN SCALLOP-WELDED TURBINE-WHEEL ASSEMBLIES
SCALLOP WELD FUSION LINE
HUB WELD FUSION LINE
DEFECTS
1 BLADE SHANK FUSION LINE CRACK
2 MAIN SCALLOP WELD BEAD CRACK
3 BLADE SHANK FUSION LINE POROSITY
4 MAIN SCALLOP WELD BEAD POROSITY
5 BLADE SHANK FUSION LINE SLAG
6 BLADE SHANK POROSITY*
7 MAIN SCALLOP WELD BEAD SLAG
8 BLADE SHANK (NOSE) FUSION LINE CRACK
9 RADIAL BLADE JUNCTION CRACK
10 MAIN WELD CRACK
11 MAIN WELD POROSITY
12 MAIN WELD SLAG
13 HUB FUSION LINE CRACK
14 LACK OF NOSE-ROOT PENETRATION
* NOT A RESULT OF WELDING—BASE METAL DEFECT THAT MAY AFFECT WELD QUALITY

FIG. 5
Compilation of weld defects

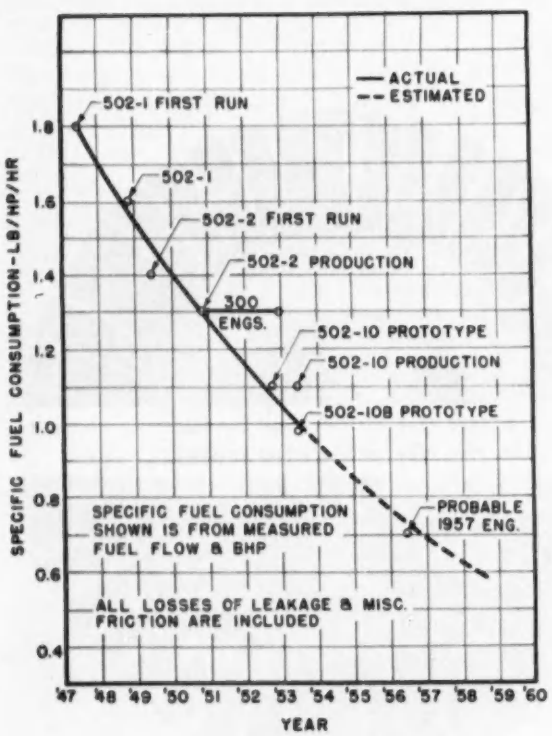


FIG. 6
Fuel consumption trend in Boeing turbines

(5) Control of unequal distribution of temperature in the hot gas stream in order to avoid "hot streaks."
(6) Prevention of blade damage from foreign objects in the gas stream.
(7) Development of manufacturing and inspection techniques to assure consistency of quality in blades and wheel disks, and their assemblies.

In working out these improvements a number of different axial type turbine wheel constructions have been investigated, particularly those shown in Figs. 3 and 4. Figure 3 is the welded type wheel where investment cast blades are welded to a forged disk. Results at Boeing so far have been the best with this type of wheel. A tremendous amount of effort went into the development of new welding techniques for this wheel before means were found to eliminate weld shrink cracks during manufacture, and crack growth during cyclic engine operation. Note the "scallop" weld shown by the wvy line at the wheel rim in the photo. Not so much development effort has-yet been put into the other types at Boeing, and it is possible that these can be made equally as rugged as the welded type. Figure 4 shows the machined fir tree construction which is used extensively and very successfully in aircraft jet engines. The ability to replace damaged blades is an important advantage, but for small wheels provision of adequate overspeed strength for the fir tree tangs of the blade and disk becomes difficult. The segment of rim circumference that can be allocated to the blade tang width will obviously be only half as much for the fir tree attachment, as for a welded blade, since the other half of the space is required for the mating tang of the disk.

It is possible to make good wheels by welding cast blades to a forged disk, but X-ray inspection is difficult, and rejects are apt to be high because a small defect in only one blade will repect the whole wheel, or blade ring.

The bi-metal cast wheel, where the hub is poured as a casting around the individually pre-cast blades, was developed cooperatively by the Haynes-Stellite Co. and the Boeing Co., and has great potential promise for low cost production. Fir-tree-type tangs are provided on the pre-cast blades, giving strength characteristics similar to the machined fir tree method, but without any grinding or broaching being required to obtain the essential close fits. The advantage of pre-casting the blades is that blade defects can be eliminated by individual X-ray and dimensional examination.

All this development to achieve a turbine wheel having dependability consistent with current piston engines, has had the effect of preventing any substantial progress in reducing the manufacturing cost of the gas turbine. The pressure for reliability has resulted in highly complex and exacting production requirements for the turbine wheels and their nozzle assemblies, making their cost exorbitant compared to piston engine components. It is quite easy to pass this off as simply a matter of mass production to get the cost down. But a closer look does not bear this out, and there is, furthermore, the necessity of building, and

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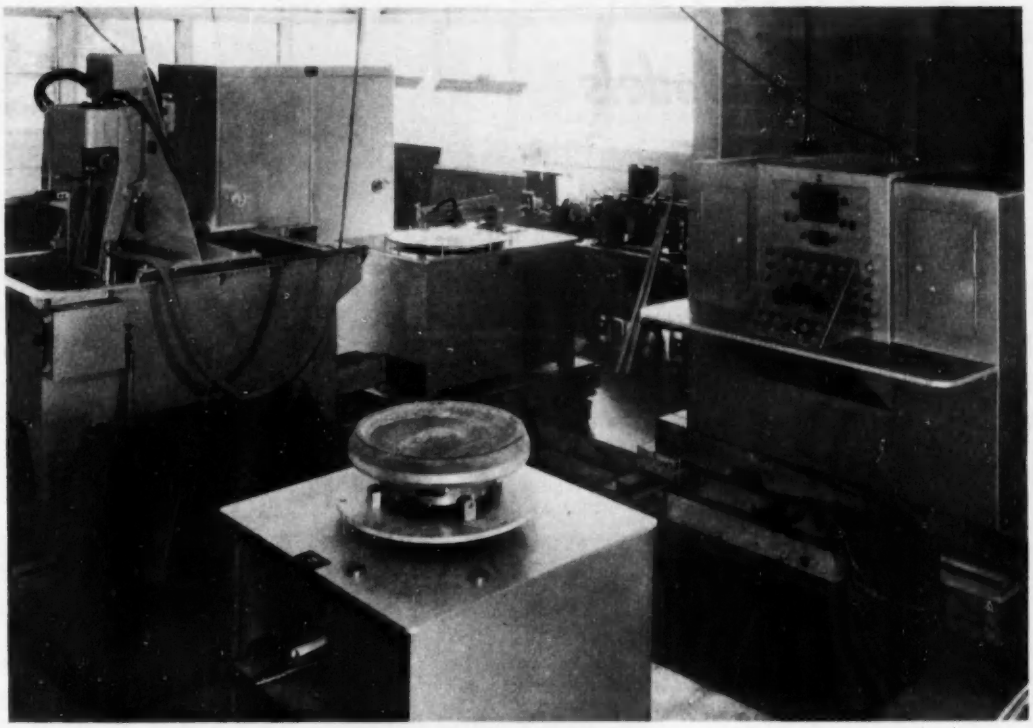
Automatic *Ultrasonic* Inspection



Shown here are major elements of SIMAC. In the foreground is the setup table; rear, left, is the immersion tank; and in the background is the punch-tape cabinet. Ahead and to the right of the cabinet is the recording device, and to the right of it is the control console.

THE inspection of jet engine rotor forgings and other unfinished engine parts will be greatly facilitated at the Quality Control Department of Allison Division, General Motors Corp. with the installation of a new ultrasonic instrument. Known as SIMAC (sonic inspection measurement and control), the equipment was developed by Sperry Products, Inc., at a cost of $300,000. An announcement of this new development appeared in the July 1 issue of AI, page 100.

The complete installation comprises a scanning machine, recorder, control cabinet, and an electronic console, which is also a monitoring station. There are two accessory units—a punch for preparing a program-controlling tape, and a setup table.

The scanning machine consists of a rectangular tank having a turntable in the bottom and horizontal ways at the top. A rigid carriage slides on the ways and is positioned horizontally by a lead screw and nut. A smaller second carriage slides on vertical ways which are affixed to the horizontally-moving unit. A scanning head is pivoted to the vertically-moving carriage.

By the combination of continuously rotating the turntable and horizontal, vertical, and angular positioning of the scanning head, the specimen is completely scanned by ultrasonic beams at a frequency of 5000 kc which emanate from a quartz crystal transducer mounted integrally with the scanning head.

At the accessory setup table, the part is aligned to a jigging plate. It is then transferred to the turntable of a scanning machine, where it is immersed in water in the tank. The water serves as a conductor of ultrasonic waves between search unit and part undergoing inspection.

A series of scan lines is then developed in sequence until the entire volume of the specimen has been thoroughly penetrated by the probing ultrasonic beams. Unwanted discontinuities within the material reflect these beams as "echo signals."

Each required motion of the scanning head is by a servo-motor which obeys the command of an array of

(*Turn to page* 104, *please*)

NEW MATERIAL for Wood Patterns and Die Models

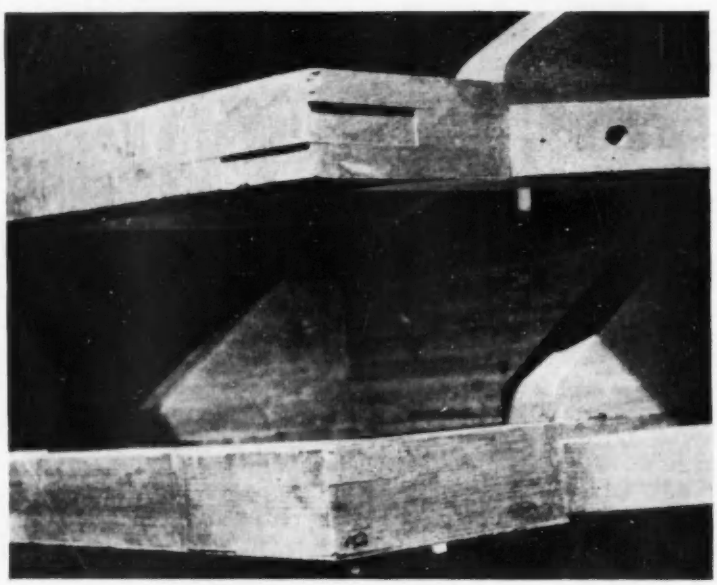
Die model of a reinforced door hinge side made from impreg. The material is no more difficult to handle than mahogany.

CONSIDERABLE interest has been aroused in the recent announcement (see AI, May 15, page 208) by Ford Motor Co. of the experimental use of plastic-impregnated, laminated mahogany board for making wood die models, wood patterns, and patterns for experimental runs of shell-molded parts. Some time ago Ford Motor Co. sponsored a research project at the Forest Products Laboratory to determine the suitability of using "impreg," as the material is called, for the making of these vital parts.

Although the properties of impreg had been well established, the effect of phenolic resins on mahogany for these unique applications had to be determined. However, this cooperative venture disclosed that the forms and structures fabricated from impreg have remarkable dimensional stability, closely approaching that of metal dies or patterns, the wood structure being unaffected by humidity or drying or temperature. By contrast ordinary mahogany models may swell or shrink so much between the time they are built and the time they are used that they require considerable resurfacing and repair.

Not only is this costly; it may result in loss of production by delaying the inception of a new car building program.

Impreg models and patterns, on the other hand, remain dimensionally stable and smooth, so much so according to Ford experts that models are readily usable for Kellering, and provide faithful steel reproduction for the press shop.



Conventional mahogany die model frame joint (top) shows the effects of pulling apart after 30-days exposure to moisture; while the laminated impreg joint at the bottom remains stable.

The Ford organization is so impressed with the preliminary results that they invite inquiries from other manufacturers in the automotive industries and offer to aid others in the adoption of this new technique. At the present time there is no commercial production of impreg laminated lumber. Accordingly, it is felt that if other manufacturers will enter the field, there will be stimulus to the production of this material in commercial quantities.

At the present time the cost of impreg is about eight times the cost of mahogany lumber. Even if this cost differential is not materially reduced through greater usage, the Ford people feel it will justify its

Roof section, of conventional mahogany construction, at left, shows considerable evidence of separation after 30-days exposure.

Rear roof section of impreg, shown below, remains dimensionally stable and without loss of surface smoothness and accuracy after 30-days exposure.

utilization. The material is easy to machine—no more of a problem than normal mahogany. On the other hand, since the investment in a die model such as a roof panel or door panel is largely labor, it is felt that the ultimate cost should be about equal since no refinishing is required later.

In the manufacture of impreg, mahogany is prepared in thin veneer form and the veneer impregnated by forcing resin solution into the sheets by application of pressure or by soaking in the resin solution. To obtain uniform impregnation without absorbing too much resin, the resins are first diluted with water to a solids content of about 30 per cent The complete disclosure of the details of impregating veneer and forming the boards is given in a paper "Application of Impreg for Patterns and Die Models" by Ray M. Seborg, Forest Products Laboratory, and A. E. Vallier, Ford Motor Co., at the Eighth Annual Meeting of the Forest Products Research Society in May, 1954.

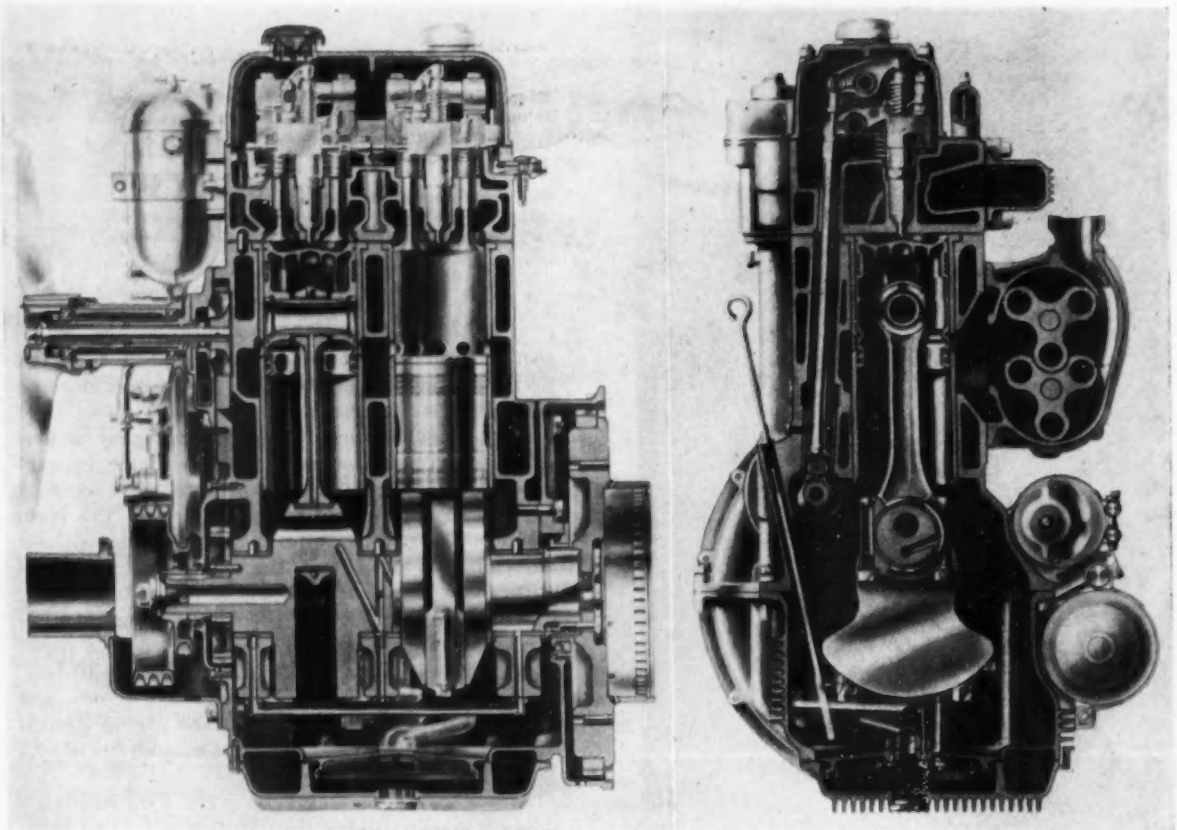
Acid resistance of impreg is high. Fire resistance is not markedly higher than that of untreated wood but resistance to heat is greatly increased. For example, impreg heated for 60 min at 300 F, then for 60 min at each 25 deg increment up to 550 F showed no significant charring or disintegration until the critical temperature of around 550 F was reached. It is this property that made it feasible to employ impreg patterns experimentally in making some large shell molded crankshaft castings.

In this program Ford encouraged the cooperation of Haskelite Corp. and Nickey Bros., Memphis, Tenn., together with the Wood Preserving Div., Koppers Co., to produce the first batch of around 5000-board-ft of impreg panels. From this supply, each die model shop and pattern shop in the Chicago, Milwaukee, and Detroit areas that makes models for Ford made experimental models. The result of their experience is the conclusion that impreg is no more difficult to handle than conventional mahogany. As a matter of fact, it was found easier to obtain smooth finish on impreg models.

Several die models for 1956 cars have been made from impreg and are now in various die shops where steel dies are being Kellered from them. Making die models from impreg should also allow greater use of duplicate plastic die models since the original impreg model will not change dimensionally because of the application of plastic formulation.

Needless to say, both the model and the framing on which it is applied are made of impreg. The gluing of sections of the structure presented a problem at the start since conventional glues are not

(*Turn to page* 160, *p'ease*)



Above is shown longitudinal section of the Lancia engine. At right, details of the piston, valve rockers, and supercharger are illustrated in this transverse section of the engine.

New Lancia Truck Has Two-Stroke Diesel Engine

THE new Beta model 4000-lb truck recently announced by Lancia & Co. of Torina, Italy, features a 119 cu in. vertical, twin cylinder, two-stroke Diesel engine. Bore of the engine is 3.94 in., stroke is 4.92 in. and compression ratio is 16 to 1. Output is 42 hp at 2000 rpm. Light alloy is used for the crankcase,

New Beta model Diesel-powered truck chassis.

cylinder block and head with steel valve seat inserts and removable cylinder liners. Fuel injectors are mounted vertically in the head, between the two exhaust valves, and are operated by push rods from the camshaft.

A three-lobe Rootes type blower is mounted on the left-hand side of the engine, just below the exhaust manifold and is belt driven from the crankshaft, air being delivered through cylinder ports uncovered by the piston. The heavy counterweighted crankshaft is carried in three plain bearings. The generator and starting motor are mounted below the blower, the former being belt driven from the crankshaft. The same belt operates the three-blade, cast aluminum fan. Lubrication is high pressure throughout, the crankcase being ribbed longitudinally to assist cooling, and the aluminum oil pan having vertical fins.

The engine forms a unit with the single plate clutch and with the five speed and reverse transmission. There is an extension housing behind the transmission, with a hand-operated brake drum on the tail shaft. A bar passes transversely through this housing and has its two extremities mounted in rubber bushings on the frame side rails. At the front the power plant is attached to a cross frame member with rubber blocks interposed.

Front wheels are independently sprung by means of a variable-rate transverse spring and widely spaced support arms. The rear axle is semi-floating, with semi-elliptic springs and has spiral bevel drive. The chassis frame and the cross members are all welded box-section, with full width outriders for the driver's cab and for the body. Twenty-four volts are used for starting and 12 volts for all other purposes. The driver's seat is mounted directly over the front wheels, to the right of the engine. Various body types are provided including van, open truck, ambulance and bus. The van has a length of 134 in. and a width of 65 in. Weight with bus body is 4270 lb and weight with full load is 9000 lb.

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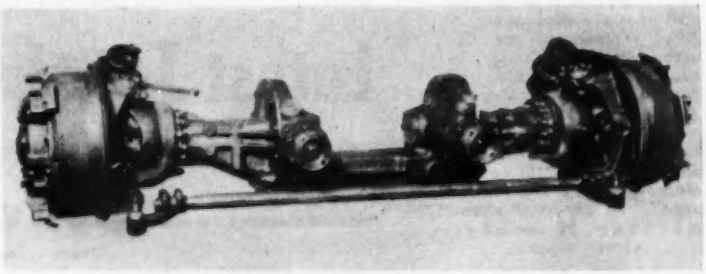
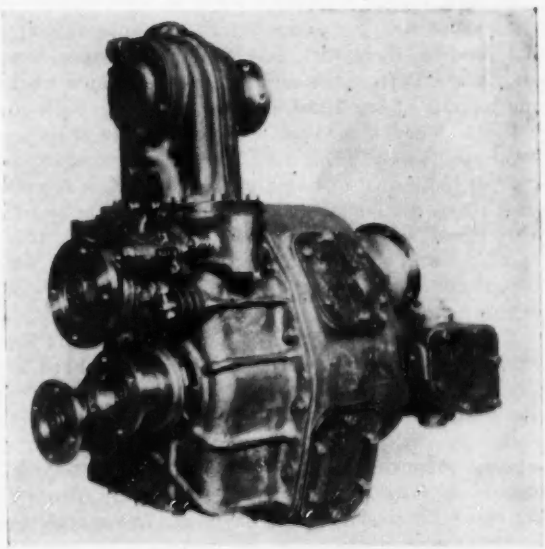
FRENCH TRUCK *has* Separate Drive *for* Each Front Wheel



Front axle assembly with individual drive to each wheel.

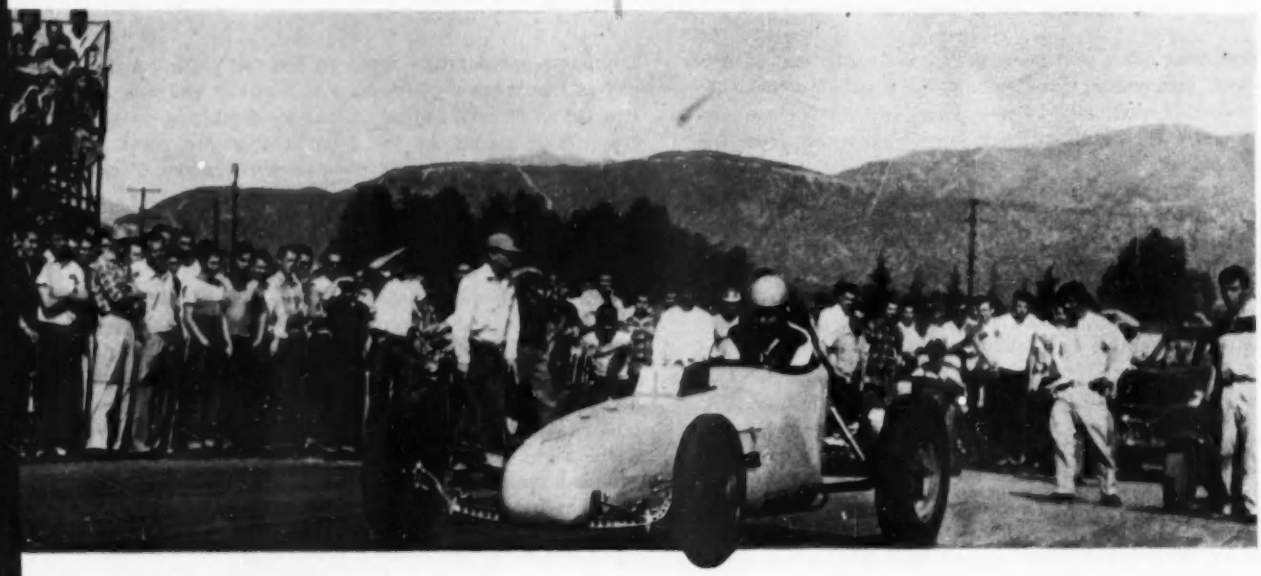
AN unusual feature of the new series of 4 x 4 trucks built by the Berliet Co., of Lyons, France, is an individual drive to each front wheel. Power is transmitted from the forward mounted, five-cylinder 125 hp Diesel engine to a central two-ratio transfer case. From here it is carried by open propeller shaft to the rear axle. Two open drive shafts carry power forward to the front axle, which is a built-up type with spiral bevel gear drive to each front wheel. The central portion of the axle is tubular and carries the two gear housings. Cast extensions are bolted up to the two housings and to the outer ends of these are the housings for the constant-velocity universal joints.

The five-speed transmission is a unit with the engine, and is on conventional lines. There is a differential in the transfer case, and drive to the front wheels is on the low ratio only. With the five-cylinder engine, road speed in fifth overdrive is 42 mph, and with the geared-down first speed four-wheel drive speed, is 1.8 mph.



Transfer case and power take-off.

Alternative models are a four-cylinder Diesel or a four-cylinder gasoline engine in the same chassis.



West Coast's fastest 'dragster' is known as Bean Bandit. To date, fastest speed is 142 mph at the end of a standing quarter-mile, clocked at the Pomona drag strip, which, in reality, is the parking lot for the Los Angeles County Fairgrounds. This car weighs 1250 lb., ready to run. Power comes from a much-modified 275 cu in. Mercury L-head V-8. Fuel is usually 75 per cent nitromethane, 25 per cent methyl alcohol.

Latest Trends in *HOT RODS*

By W. G. Brown

Photos credit HOT ROD Magazine

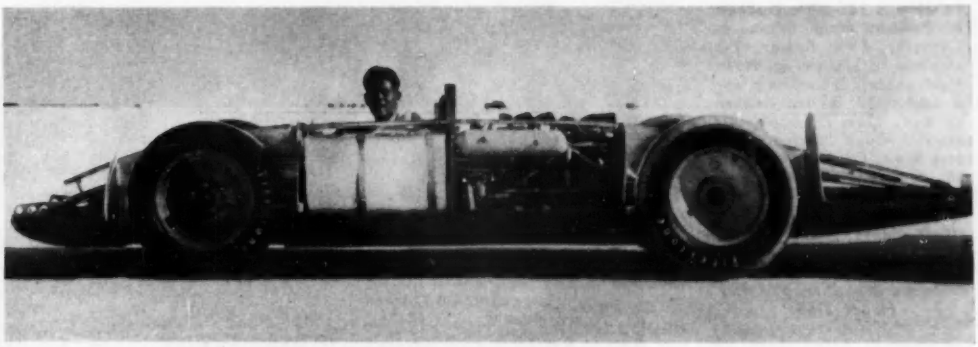
THE last time a feature article in AUTOMOTIVE INDUSTRIES dealt with hot rods and the hot rod sport was February 15, 1949. Since this time, hot rodders, their cars and their sport have come a long way. Drivers, owners and builders have learned the benefits of organization and cooperation with civic officials. They have learned how to make their cars safer yet faster. They have learned how to stage and control their own off-the-highway activities, complete with police assistance and unbelievable safety records. This knowledge has been gained the hard way. It has been, and still is, an uphill battle, but one that is being fought and won in all of its various aspects every day in this country.

The "classic" hot rods, the Model A and 1932 Ford roadsters powered by modified late model Ford and Mercury L-head engines, have all but vanished from the American highway. The modern hot rod is a late model car, usually a coupe or sedan in the low or medium price bracket, that is virtually undistinguishable from your next door neighbor's car. However, the resemblance ends under the hood. The engine compartment may contain one of a number of large displacement overhead valve power plants in standard or modified form, or the engine with which the car was originally equipped may be modified to produce almost twice its original horsepower.

To the hot rodder, large piston displacement means additional torque and horsepower. Consequently, better acceleration and top speed are gained with less engine wear and tear, if the large engine is installed in a relatively light weight chassis. At times, their adage "anything will fit in anything" is severely challenged, but now it is commonplace to see Fords, Mercurys, Chevrolets and Oldsmobiles of varying vintage fitted with Chrysler, Cadillac, De Soto, GMC, Lincoln or Oldsmobile overhead valve engines. Such an engine will usually produce the required degree of power in near-standard form, without the extensive modifications that would detract somewhat from engine longevity and reliability.

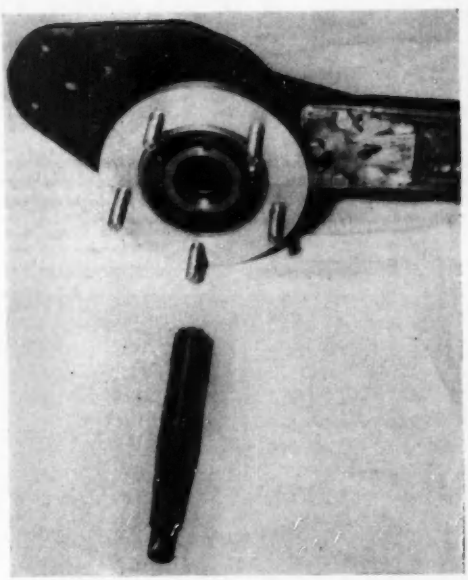
Power, transmitted to the driving wheels, is usually routed through a manual shift transmission, which is still highly regarded when optimum performance is required. Many times, a planetary overdrive is used in conjunction with such a gearbox. When automatic power transmission is desired, the torque converter types have been largely replaced with Hydra-Matics. The final drive ratio is usually the lowest numerical ratio available with the car's standard rear axle assembly.

A car so equipped will provide long and dependable service. It can be made to handle with equal ease in city traffic or on the highway. It has an honest 110 to 115 mph top speed and accelerative qualities that would frighten the average motorist. In fact, such a



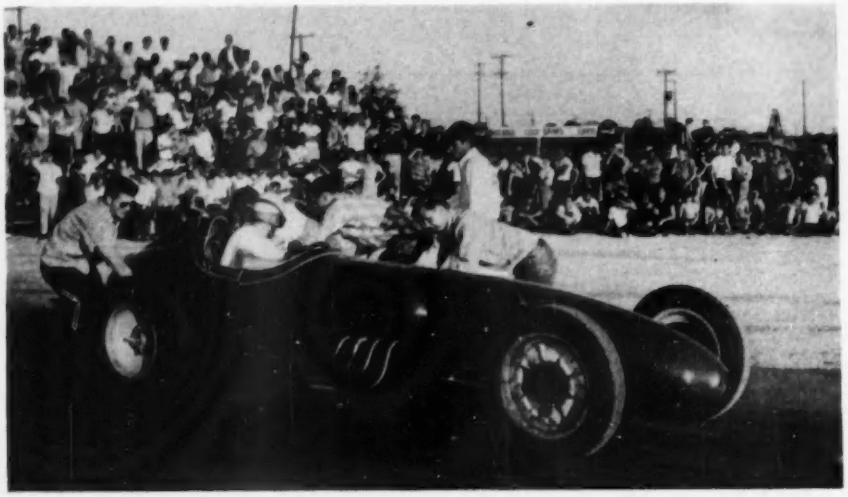
Profile view of the Shadoff car with body removed shows large tank for engine cooling water beside driver. Water header tank is located alongside engine. Note magnesium wheels.

Low and sleek, the Shadoff car is a beautiful example of design, construction and execution and represents the ultimate in American backyard automotive ingenuity.



This view shows the right rear axle shaft bearing carrier of the Shadoff Special. The hub was machined from aluminum bar stock. Holes in plate anchor DeDion tube which is located laterally by a ball and socket in the center of the frame.

England's Capt. G. E. T. Eyston, forward, leaning over Shadoff car, chats with engine builder Ray Brown. Scoop at left forces air through oil cooler and then to engine compartment. Behind scoop at right is a small, specially made radiator for engine cooling water.

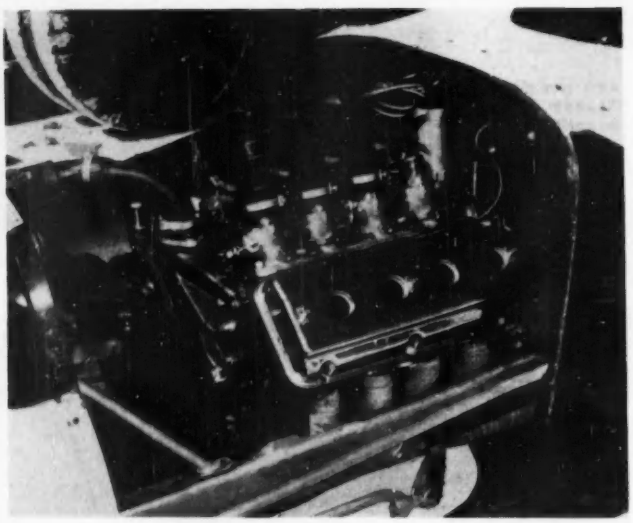


Newest dragster in Southern California area has yet to hit its stride. Best time to date is 136 mph, clocked at Pomona strip. Engine is Chrysler Fire Power V-8 sleeved to 300 cu. in. Note that engine is located approximately in the center of car. Car is relatively heavy, about 1800 lb., for this type. Of total weight, 60 per cent (with drive) is on rear wheels. Power is transmitted through a dry, single plate clutch to a pre-1940 Ford gearbox in which all gears have been removed except second and direct high.

car has everything its predecessors could ever have, plus comfort.

For the competition minded, quarter-mile acceleration trials have witnessed a phenomenal growth since their organized inception in 1951. Today there are over 100 known and recognized drag strips, as they are called, in all sections of the country. This phase of the sport is flourishing because of a lack of localized sites, suitable for top speed straightaway runs. Unified competition rules and those governing the safety of competitors and spectators have been established by the headquarters of the 18,000-plus member National Hot Rod Association. In addition to several sections for standard and modified cars using gasoline for fuel, there are also separate sections for cars designated as competition machines, in which there are no fuel restrictions. The classes of the "stock" or standard cars are controlled by a power-to-weight ratio in which the advertised shipping weight is divided by the advertised brake horsepower output. Cars with

(*Turn to page* 86, *please*)



Modified Dodge Red Ram ohv V-8 engine in a competition roadster. This engine uses standard bore, stroke, pistons, valves. Special equipment is Hilborn fuel injection device, steel camshaft, lightweight, tubular cam followers, Scintilla Vertex magneto.

Modified roadster of Don Waite's uses 1927 Ford Model T body, streamlined nose and front end fairings. Engine is behind cockpit. Tower above body houses 'ram' tubes for sleeved, destroked 257 cu in. DeSoto FireDome ohv V-8 engine. Car was clocked at 191.59 mph one-way and 187.667 mph for a two-way average. Straight methyl alcohol was used for fuel.

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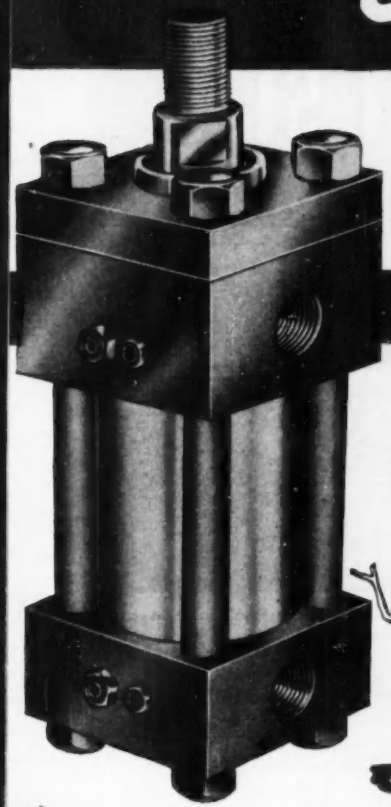

Any of the *Interchangeable* "Stock" Mountings illustrated are attached by our factory to the "in-stock" Basic Model 53 with the tie rod nuts in a few moments. This gives you a selection of over 500 different "Stock" Cylinders for *immediate use*—and permits easy conversion to other models for *future re-use*. Thus, you save delivery and production time, investment cost and storage space.

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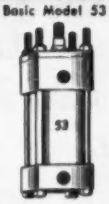
(Prices on the separate mounting attachments for future re-use are available on request)



Basic Model 53 — Tie Rod Mounting

Model 77 — Foot Mounting

Model 61 — Rod End Flange

Model 62 — Cap End Flange

Model 65 — Rod End Flange

Model 66 — Cap End Flange

Model 86 — Pivot Mounting

Bore	Stroke	Cushion	AIR A53	HYD. H53	AIR A61 A77	HYD. H61 H77	AIR A62	HYD. H62 H65	AIR A66	HYD. H66 H86
1½"	2"	Non		$ 58.50		$ 61.40		$ 66.70		$ 72.85
1½"	4"	Non		60.70		63.60		68.90		75.05
1½"	6"	Non		62.90		65.80		71.10		77.25
1½"	8"	Non		65.10		68.00		73.30		79.45
1½"	11"	Non		68.40		71.30		76.60		82.75
2"	2"	Non	$ 37.70		$ 39.75		$ 42.30		$ 44.60	
2"	4"	Non	39.40		41.45		44.00		46.30	
2"	6"	Non	41.10		43.15		45.70		48.00	
2"	8"	Non	42.80		44.85		47.40		49.70	
2"	11"	Non	45.35		47.40		49.95		52.25	
2"	3"	Both	62.05	94.50	64.10	97.45	66.65	103.05	68.95	111.55
2"	5"	Both	63.75	97.00	65.80	99.95	68.35	105.55	70.65	114.05
2"	7"	Both	65.45	99.50	67.50	102.45	70.05	108.05	72.35	116.55
2"	9"	Both	67.15	102.00	69.20	104.95	71.75	110.55	74.05	119.05
2"	13"	Both	70.55	107.00	72.60	109.95	75.15	115.55	77.45	124.05
2½"	2"	Non	41.45	73.30	43.70	76.25	46.25	82.30	49.00	93.10
2½"	4"	Non	43.35	76.00	45.60	78.95	48.15	85.00	50.90	95.80
2½"	6"	Non	45.25	78.70	47.50	81.65	50.05	87.70	52.80	98.50
2½"	8"	Non	47.15	81.40	49.40	84.35	51.95	90.40	54.70	101.20
2½"	11"	Non	50.00	85.45	52.25	88.40	54.80	94.45	57.55	105.25
3¼"	3"	Both	77.80	126.85	80.35	131.20	84.15	138.60	87.70	149.95
3¼"	5"	Both	79.80	129.85	82.35	134.20	86.15	141.60	89.70	152.95
3¼"	7"	Both	81.80	132.85	84.35	137.20	88.15	144.60	91.70	155.95
3¼"	9"	Both	83.80	135.85	86.35	140.20	90.15	147.60	93.70	158.95
3¼"	13"	Both	87.80	141.85	90.35	146.20	94.15	153.60	97.70	164.95
4"	2"	Non	56.25	106.00	59.10	111.15	62.95	118.90	67.30	132.80
4"	4"	Non	58.85	109.40	61.70	114.55	65.55	122.30	69.90	136.20
4"	6"	Non	61.45	112.80	64.30	117.95	68.15	125.70	72.50	139.60
4"	8"	Non	64.05	116.20	66.90	121.35	70.75	129.10	75.10	143.00
4"	11"	Non	67.95	121.30	70.80	126.45	74.65	134.20	79.00	148.10
5"	3"	Both	98.25		101.40		105.25		110.60	
5"	5"	Both	101.65		104.80		108.65		114.00	
5"	7"	Both	105.05		108.20		112.05		117.40	
5"	9"	Both	108.45		111.60		115.45		120.80	
5"	13"	Both	115.25		118.40		122.25		127.60	
6"	2"	Non	80.60		83.95		87.85		94.15	
6"	4"	Non	84.90		88.25		92.15		98.45	
6"	6"	Non	89.20		92.55		96.45		102.75	
6"	8"	Non	93.50		96.85		100.75		107.05	
6"	11"	Non	99.95		103.30		107.20		113.50	
8"	3"	Both	157.35		161.05		167.90		174.95	
8"	5"	Both	162.45		166.15		173.00		180.05	
8"	7"	Both	167.55		171.25		178.10		185.15	
8"	9"	Both	172.65		176.35		183.20		190.25	
8"	13"	Both	182.85		186.55		193.40		200.45	

Miller "Stock" Cylinders fully meet the J.I.C. Standards and are identical to Miller "Custom-Built" Cylinders in design and construction.

"Stock" Air Cylinders are for 200 psi operation, "stock" hydraulic cylinders for 2000-3000 psi operation. Piston Rods of "Stock" Cylinders are "Style No. 2 Standard."

For complete descriptive and dimensional data on both "Stock" and "Custom-Built" Miller Cylinders, write for Bulletins A-105 and H-104 sent FREE on request.

Sales and Service From Coast to Coast!

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"Stock" Boosters, Too! Immediate delivery on Miller Dual Pressure Boosters; 5" bore, 1" ram (80 psi air input produces 2000 psi hydraulic output for driving one or more work cylinders simultaneously). In 6" and 12" strokes. Write for data and prices.

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AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
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At work within an assembly, and along the assembly line, and out in the field service shops, it is mighty important that Duroid Gaskets are made to close thickness tolerances and are dimensionally stable.

CLOSE TOLERANCES mean uniform compressibility over the entire gasket surface: the gasket holds better.

CLOSE TOLERANCES mean easy standardization of wrench torques when assembling: you get a better job and get it quicker.

CLOSE TOLERANCES mean faster work in the service shop: the mechanic does more straight-away work and less experimenting to do the job right.

RATIO OF TENSILE STRENGTH TO DENSITY IS AMAZINGLY HIGH

You can install Duroid Gaskets with no fear of their blowing under pressure.

SPECIAL FORMULATIONS ARE EASILY AVAILABLE

Within each series shown here special formulations can be made to meet specific needs for compressibility, recovery and other performance requirements.

Rogers DUROID asbestos-elastomer gasket sheeting can be held to thickness tolerances of ±6%.

DUROID 3100 SERIES — Neoprene and asbestos recommended for use with oil, gasoline, freon and in water systems with anti-freeze. DUROID 3102 conforms with Spec. MIL-G-7021, Class 2 and AMS 3231.

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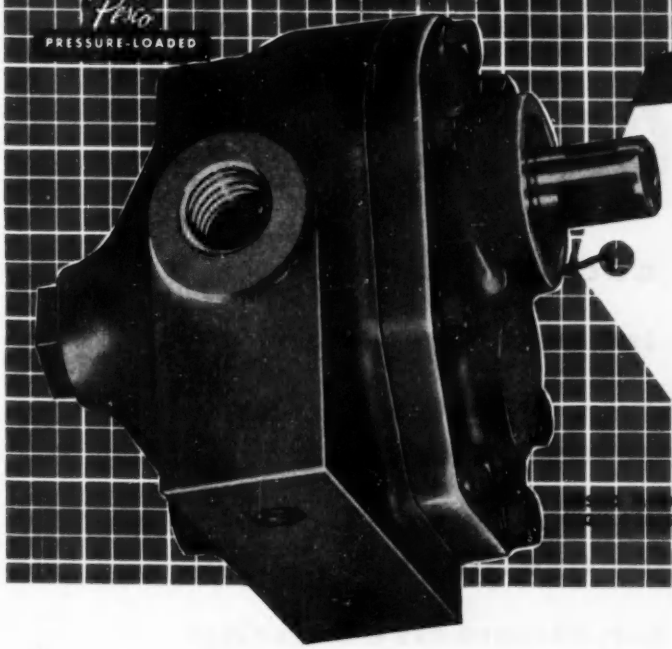
HERE'S A REALLY GREAT HYDRAULIC PUMP... it's PROVED and AVAILABLE!



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Pesco HIGH PRESSURE GEAR PUMP

PRESSURES UP TO 2000 PSI

EFFICIENCIES: VOLUMETRIC—UP TO 94%
MECHANICAL—UP TO 88%

OPERATION: CONTINUOUS DUTY WITH OIL AT 150° F.

CAPACITY: 11 GPM AT 2400 RPM

AUTOMATIC ADJUSTMENT FOR OPERATING WEAR

Here is a new Pesco *Pressure-Loaded* Pump you will want to investigate immediately! It is one of the most outstanding of many fine Pesco pump products, and provides unparalleled advantages for hydraulic power applications.

New developments of the famous Pesco Pressure-Loaded principle incorporated in this model have resulted in new high standards of performance and dependability. From the original development tests through many rugged field applications, this Pesco pump has constantly exceeded anticipated performance.

With volumetric efficiencies up to 94%, mechanical efficiencies up to 88%, and capacity of 11 gpm, it develops pressures up to 2000 psi. In addition, it operates on continuous duty with oil temperature of 150° F.

Pesco Hydraulic Engineers will be glad to show you how this outstanding Model 051002-110 will improve operation of your equipment. Simply call or write the Home Office, Bedford, Ohio.

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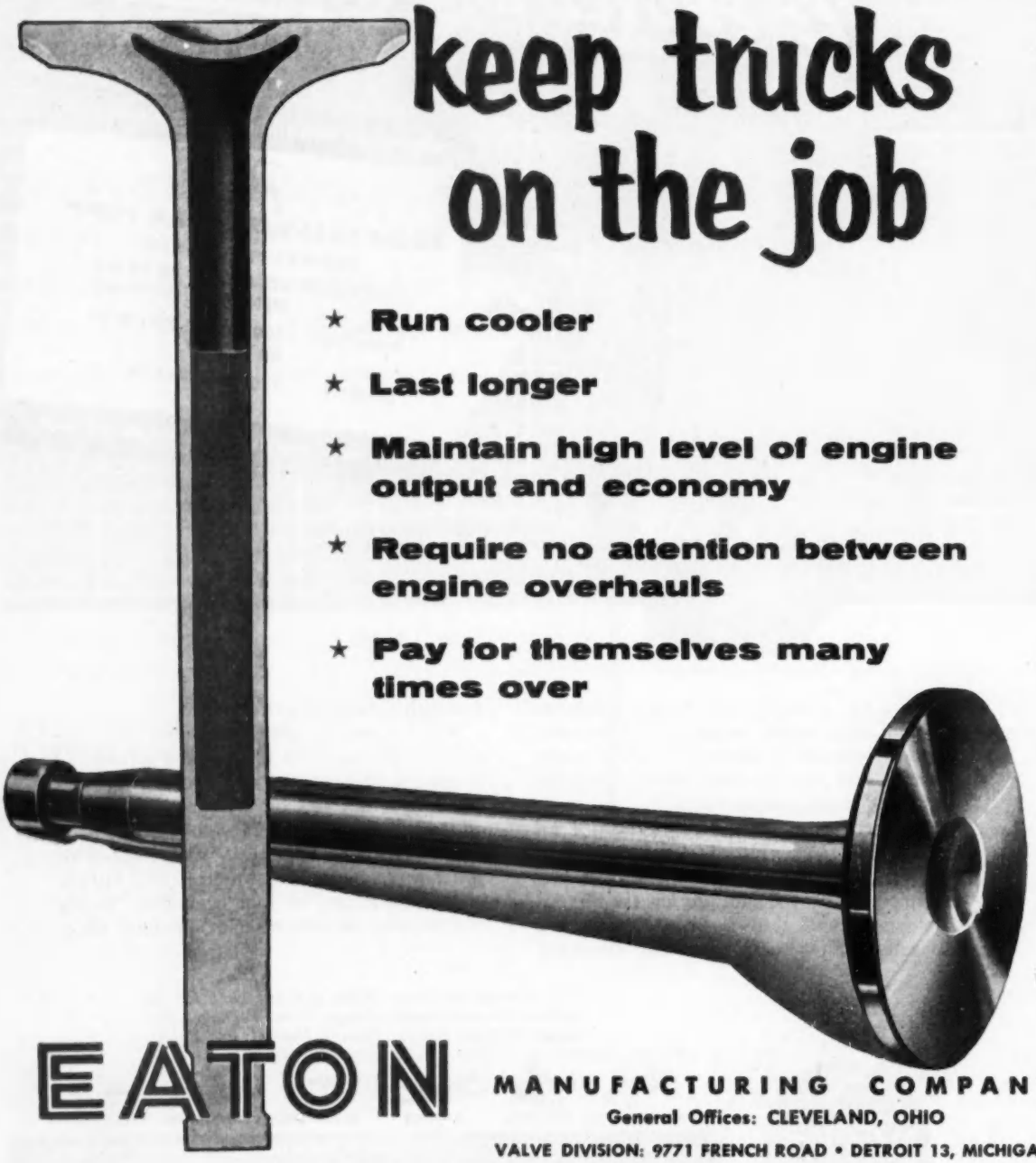

- ★ **Run cooler**
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Assembly operation eliminated

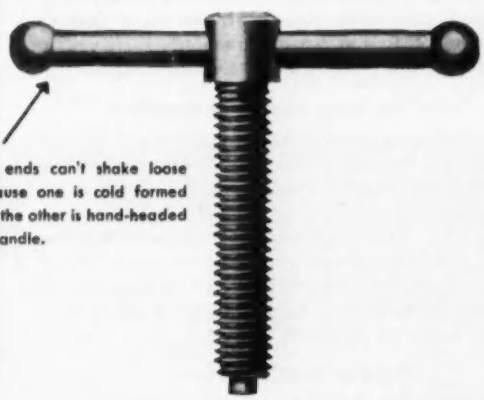
The old way:

This vise handle was originally cut from bar stock by screw machine. One end of the handle was threaded while the other was machined to a ball head. To complete the assembly a separate internally threaded ball head had to be screwed onto the threaded end by hand.

The National way:

Our "Special Products Service" showed how this vise handle could be produced faster and at lower cost by cold heading. The handle and one head were cold formed to required dimensions. Then, the handle was inserted through the drilled hole in the head of the jaw adjusting screw and the other end was hand headed. Result . . . substantial savings in material and production costs.

Ball threaded to end was often lost in use.



Ball ends can't shake loose because one is cold formed and the other is hand-headed on handle.

Bring your "Special" problems to National

National has the experience and wide range of cold heading equipment needed to solve many "special" problems. Our "Special Products Service" representative will be glad to study your requirements. Write for free copy of National's "Special" fastener booklet.

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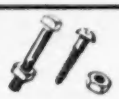
National PRODUCTS

Fasteners  Hodell Chains Chester Hoists

Here's why a press builder installs Farval when he wants foolproof lubrication

Studies in Centralized Lubrication No. 152

ONE bearing missed by grease gun or oil can and the finest press can be out of production. To avoid this possibility, the builder of these newly-designed Cleveland power presses in a famous appliance maker's mid-western manufacturing plant installed modern lubrication systems—Farval!

Farval Eliminates Lubrication Downtime

Farval is the foolproof Dualine system of centralized lubrication that hydraulically delivers a measured amount of clean lubricant at regular intervals to all bearings, *never missing any.* In this way, downtime due to hit-and-miss lubrication is completely eliminated. To lubricate an average press with Farval takes only one minute *while the press is in operation!* Compare this to the 15-20 minutes it takes each time to lubricate by hand.

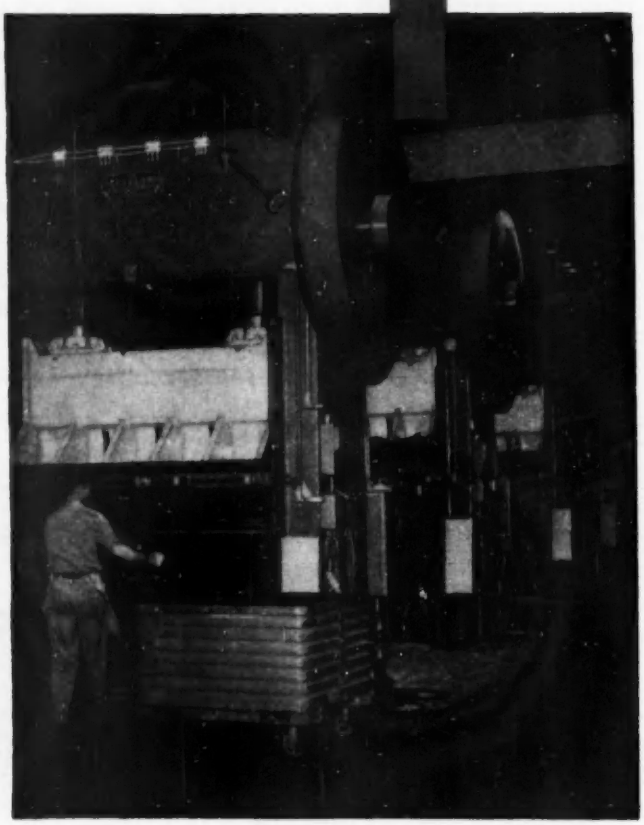
Saves up to 75% Lubricant

The moment you install Farval, you start to save up to 75% of former lubricant consumption. Not only that, but you also get rid of splashes of dangerously slippery grease or oil because Farval is a safe, completely enclosed system.

Press builders prefer Farval because the Farval Dualine valve is simple and sure, with wide ports engineered to deliver the *exact* amount of lubricant required. There are no uncertain springs, ball-checks or pinhole ports to cause trouble. With only two moving parts, the Farval measuring valve is trouble-free! Indicators at every bearing show *positive proof* that each valve has functioned.

Why not give your presses the life insurance they need? Install Farval! Write for Bulletin 26. The Farval Corporation, 3296 E. 80th St., Cleveland 4, O.

Affiliate of The Cleveland Worm & Gear Company, Industrial Worm Gearing. In Canada: Peacock Brothers Limited



KEYS TO ADEQUATE LUBRICATION—Wherever you see the sign of Farval—the familiar valve manifolds, dual lubricant lines and central pumping station—you know a machine is being properly lubricated. Farval manually operated and automatic systems protect millions of industrial bearings.

Battery of 8 presses equipped with Farval in the shop of a large kitchen-range manufacturer. Photo courtesy of The Cleveland Punch & Shear Works Co.

News of the MACHINERY INDUSTRIES

By Thomas Mac New

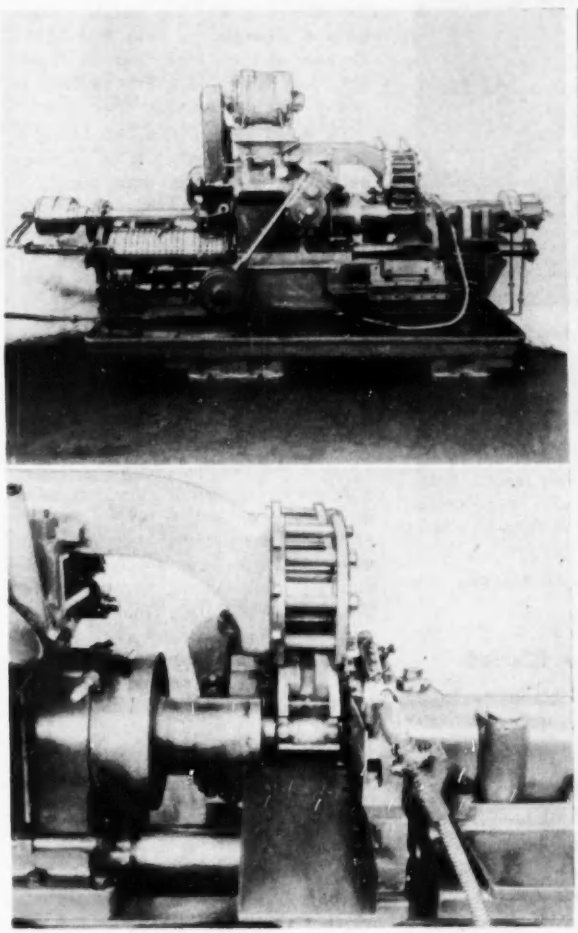
AUTOMATION is not entirely responsible for increased production of automotive parts. Back in 1930, the Caterpillar Tractor Co. ordered a number of Fay automatic lathes from Jones & Lamson. These lathes were equipped with a device for automatically loading a track link bushing for processing in the lathe. The machine tool together with its automatic loading device suitable for automation had an output of 120 pieces per hour. Early this year Caterpillar ordered another group of Fay automatics with exactly the same automatic loading device to be used for the same type of workpiece, but the output of the machines is about three times that of 1930 vintage. Both the 1930 and 1954 units were factory-equipped with hopper feeds.

Considering the hopper feeds as automation devices which can feed parts at any predetermined speed, then the increased production lies in the new machine tools. In this case, it's a combination of improved machine design, higher horsepower motors, and carbide tooling. The Jones & Lamson designation for the better overall machine output is "High Velocity Turning."

Although automation is today's production byword, it must not be forgotten that machines and inspection devices have been and are being built to handle high production requirements.

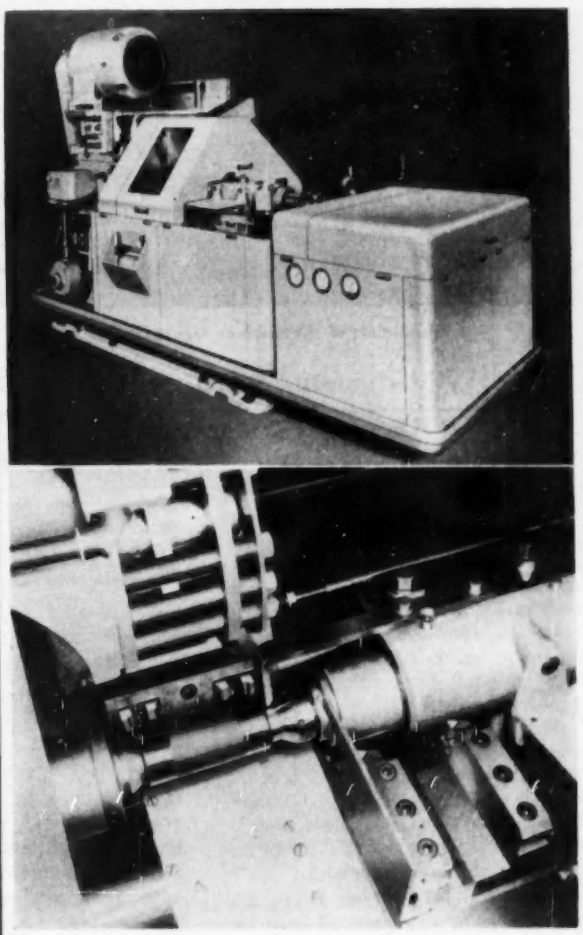
In an early issue of AUTOMOTIVE INDUSTRIES, this column will have an item concerning Cone multiple spindle bar machines. These new machines produce parts so rapidly that now an automation device has to be made to keep the bar feed loaded. This is a case where the machine has outdistanced current mechanical materials handling devices.

EARLY EQUIPMENT



J & L Fay lathe of 1930 equipped with automatic loading chute. Production rate: 120 pieces per hour.

NEWEST EQUIPMENT

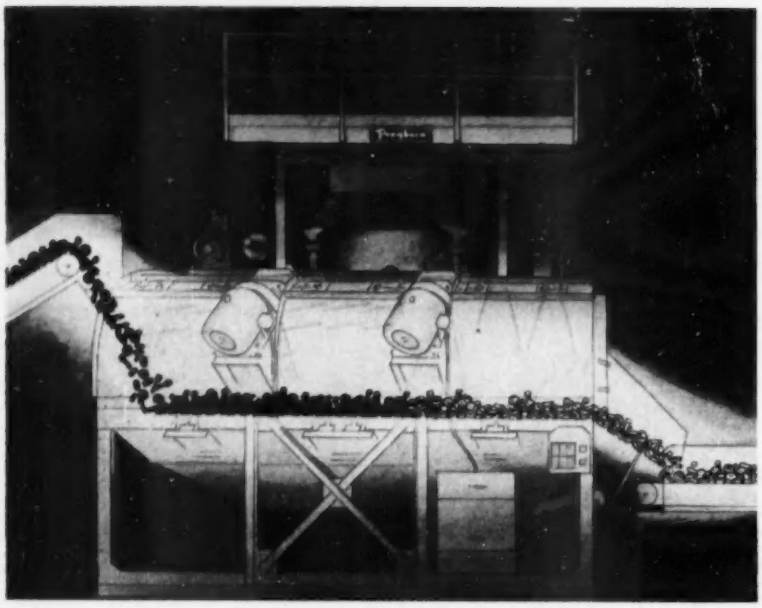


Although same type of automation device is used, 1954 unit, depicted here, turns out work three times faster.

NEW EQUIPMENT PLANT • PRODUCTION

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Five Barrel Sizes for Abrasive Cleaning in Foundries



Visualization of the Pangborn type GO cleaning barrel in use.

Five sizes of type GO continuous-flow Rotoblast cleaning barrels ranging from 48 in. to 72 in. diameter drums, are said to be ideally suited for applications such as a foundry planning a maximum amount of automatic operation. They are then installed so that conveyors bring castings from the shakeout and cooling conveyor directly into the barrel, where they are continuously moved through while being tumbled and blast cleaned. All abrasive is reclaimed before cleaned castings are discharged from the barrel, either onto a conveyor or into tote boxes. Because of their high cleaning capacity, the barrels are best suited to heavy volume cleaning operations.

Capacity ranges from 50-60 cu ft of castings or 30-40 cu ft of forgings per hr of up to 11-in. diam pieces, to 300-400 cu ft of castings or 150-250 cu ft of forgings per hr of up to 26-in. diam work pieces. *Pangborn Corp.*

Circle 58 on postcard for more data

Scale for Plastics

A mercury-magnetic control, Model 1324 MMC, portable semi-automatic sacking scale, for use in sacking resins and molding compounds, is equipped with automatic cutoff controls and a 5 by 7 in. automatic dust control valve. The double mercury magnetic controls provide fast and slow rate of feed, allowing exceptional accuracy.

The machine is equipped with sack rest, pulling handle, wheel chuck and weights. All components including the counterweight platter are enclosed. Change-over from one weight sack to another is accomplished by merely changing the counterweight.

A visual indicator dial shows 2½ lb under by ½ lb over, graduated for the first four oz over-and-under by one oz. This visual indicator provides the operator with a visual reference for checking every sack. Both fast and slow feeds can be adjusted to infinity. *The Exact Weight Scale Co.*

Circle 56 on postcard for more data

Large Sprag Clutch

A series of large-bore sprag type clutches for over-running, indexing, and backstopping is announced for applications requiring large-bore sizes up to 12 in. The new clutches provide maximum torque capacity for size and weight and instantaneous engagement (without head shaft wind-up). They will be constructed with ball bearings for smooth, easy over-running. *Formsprag Co.*

Circle 57 on postcard for more data

Pressure Tape

A versatile sealing tape, extruded in ribbons or beads, with excellent pressure sensitive adhesion to most materials, has been developed. The tacky, fibrous mastic, known as No. 579.6, protects metals from corrosion, water and dust, will not swell rubber parts, is non-staining and non-bleeding, and remains permanently soft. It will not flow at 300 F and will not harden at −65 F.

The light green, odorless sealer was developed for the aircraft and plastics industries. One use is to seal a Plexiglas inspection window to the magnesium body of guided missile castings. The window can be opened by control adjustments made, and the window replaced without additional resealing. *Presstite Engineering Co.*

Circle 59 on postcard for more data

Inspects Gears at High Production Rates

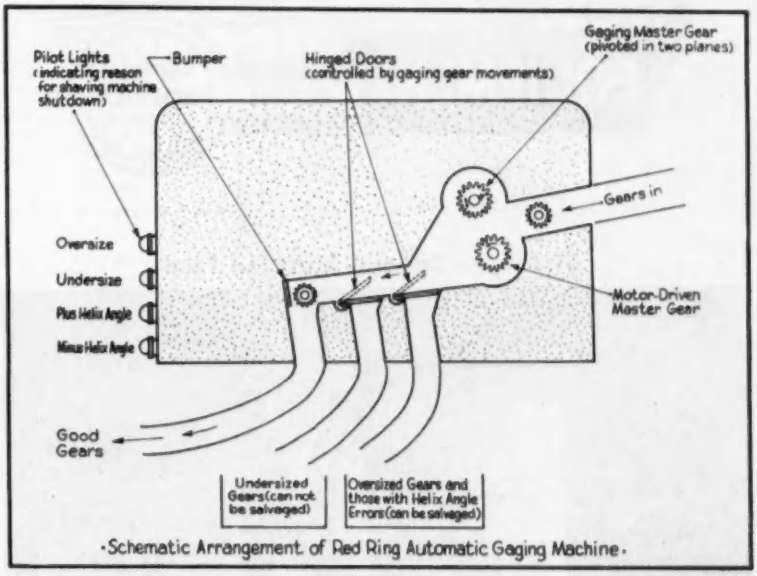
Fully automatic, a gear gaging and sorting machine, first in a new line of Red Ring gear inspection equipment for modern automated production lines, embodies new basic concepts in the art of high speed gaging and sorting. It makes up to four checks on gears for both size and helix angle accuracy.

The machine can be installed in an automated line and gage gears either before or after shaving in conjunction with chutes, Syntron units or other types of feeding devices. It can also be magazine-fed and utilized as a separate gaging device. Built-in controls are included in the machine to shut off the shaving machine after a predetermined number of reject gears are produced.

Gears that meet inspection requirements are directed through a chute in the base of the machine. Undersize gears are directed to another feed chute. Those which are oversize and have errors in helix angle are directed through still another feed chute. This permits the sorting of salvageable gears from those that not be salvaged.

Auxiliary electrical components for the machine such as relays and switches are enclosed in a separate unit, which permits the gaging unit proper to be extremely compact. This feature permits the machine to be placed a minimum distance from unloading devices on shaving machines.

Signal lights on a control panel at the front of the machine indicate which of the four conditions (oversize, undersize, plus helix angle or minus helix angle) caused the gaging machine to shut down the shaving machine. This feature cuts machine down time for correcting errors.


Pilot Lights (indicating reason for shaving machine shutdown)
Bumper
Hinged Doors (controlled by gaging gear movements)
Gaging Master Gear (pivoted in two planes)
Gears in
Oversize
Undersize
Plus Helix Angle
Minus Helix Angle
Motor-Driven Master Gear
Good Gears
Undersized Gears (can not be salvaged)
Oversized Gears and those with Helix Angle Errors (can be salvaged)
Schematic Arrangement of Red Ring Automatic Gaging Machine

A schematic drawing of the gear gaging and sorting machine showing how gears are gaged and sorted into correct gears, reject gears that can be salvaged, and reject gears that cannot be salvaged

Inspection of the gear is accomplished by its passage between master gears. Movements of the gaging master gear control hinged covers in the exit chute through electric controls and lever arrangements. *National Broach & Machine Co.*

Circle 60 on postcard for more data

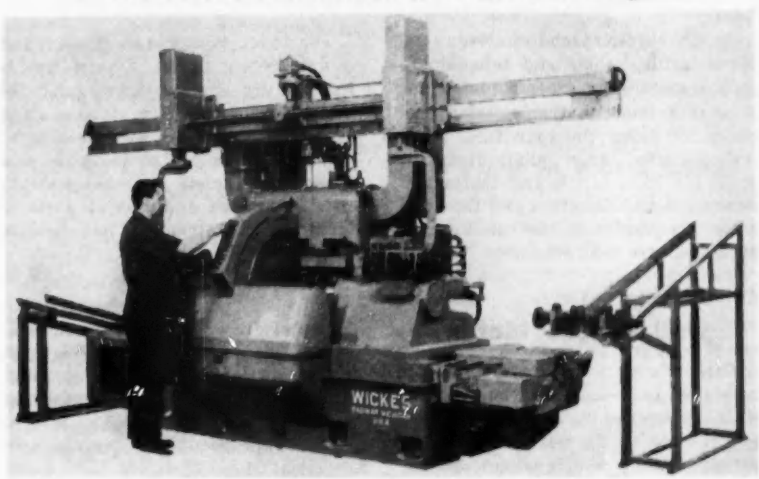
The new Red Ring gear gaging and sorting machine that makes up to four inspection checks on production spur or helical gears automatically.

Vibration Plotter

A portable resonant vibration plotter is now available to aid analysis of mechanical damping factors in rotating machinery. Features include scale expansion and an accuracy of frequency measurement to within 0.1 per cent. By using an external E-put meter, accuracy can be increased to as high as 0.01 per cent. *Franklin Electronics, Inc.*

Circle 61 on postcard for more data

Lathe Turns Crankshafts Automatically



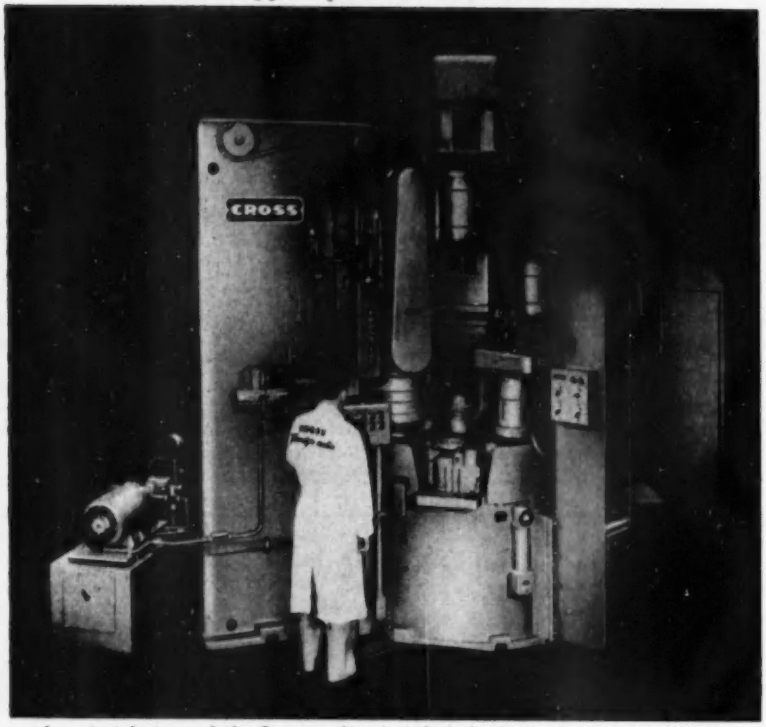
Operations on V-8 crankshaft soon going into production are check, turn, space and fillet five main bearings, flange and stub ends complete. CH-4 automatic center drive type lathe has hydraulic-operated loader and unloader. (Wickes Brothers)

Circle 62 on postcard for more data

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 73

Dial Type Special Machine Tool



Important features of the Cross machine include hydraulic feed and rapid traverse, hardened and ground ways, filtered coolant systems, and construction to JIC.

A dial type special machine tool bores, drills, reams and taps aluminum transmission shaft supports for a large automotive transmission producer. It turns the rear face, counterbores the large pilot diameter, drills six holes, drills and reams two locating holes, chamfers and taps five holes. Production is 128 castings per hr at 100 per cent efficiency.

The index table has six stations and is fluid motor driven. One station is for loading and unloading and the other five are working stations. The work holding fixtures are operated by hydraulic power. The machine provides for complete interchangeability of all standard and special parts to facilitate maintenance and reduce downtime. *Cross Co.*

Circle 63 on postcard for more data

Stall Torque Motor

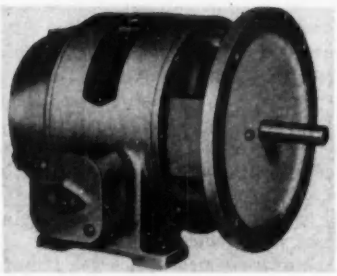
Torque motors now available can be stalled or locked, with current on, without damage to the motor. The unit automatically adjusts its speed to intermittent load changes, at the same time maintaining a constant power.

Applications for this new motor include closing and holding closed electrical contactors, valves and locking devices; opening and holding open brakes; lifting and holding up cams. Machine tools and pump applications are additional uses that are said to take advantage of the unit's unique electrical characteristics.

Torque motors are also suited to tandem installations where another motor sets the pace. An example of this is the winding of scrap as it is being slit from a metal sheet.

Ratings are measured in foot pounds of torque rather than horsepower. Standard units from ½ through 10 ft-lb, with across-the-line locked service duty of 5, 10, 20, 60 minutes and continuous, are available. *Reuland Electric Co.*

Circle 64 on postcard for more data



A three ft-lb, 10-pole, 60-minute Locked, foot-mounted Reuland Torque Motor with with special flange type end bell.

Hi-Temp Tape

High temperature masking tape No. 113 was designed specifically for masking pretreated surfaces, such as anodized aluminum and magnesium. It will adhere at baking temperatures up to 350 F and is available to industrial consumers in 15 standard widths ranging from ¼ in. to three in. *Behr-Manning Corp.*

Circle 65 on postcard for more data

Vinyl Sponge

A vinyl sponge plastisol, furnished as a pourable liquid, expands upon curing at 350 to 375 F to a uniform cellular vinyl sponge. No extra equipment other than molds and an oven is necessary. A chemical blowing agent incorporated in a special vinyl plastisol causes expansion at atmospheric pressures. This versatile compound may be modified by the manufacturer to various densities, tear strengths, elongations, and chemical resistances for various end uses.

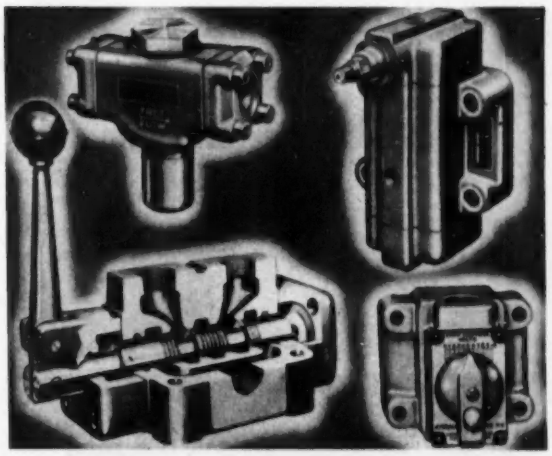
Inexpensive aluminum molds or electroformed copper molds may be used in the sponging or curing process. This vinyl sponge in combination with vinyl pastisol skins produces in a single operation finished articles such as arm rests, cushions, crash pads and gaskets, with a leather-like finish in any color, as well as a metallic finish.

These unique compounds may also be sprayed and cured as a film. The expanded film acts as a sound deadener. *Watson-Standard Co.*

Circle 66 on postcard for more data

Extensive Valve Line

Features of a line of hydraulic valves, consisting of more than 3500 models, include a full floating operating lever on directional valves to give feel of the control, "O" ring seals on each end of the valve body to assure leakproof operation, full flow design for a minimum of pressure drop through the valve. Long lands on both the valve body and spool to prevent binding of the spool, selectively fitted spools, machined inlet and cylinder ports, and interchangeable end caps to permit changing of the valve assembly to reverse valve ports are others.



The H-P-M hydraulic valve line has been expanded.

The new H-P-M valve line consists of directional and functional valves—each available with optional body styles, types of control, methods of operating and other features for universal application.

Directional valves are offered in threaded, flange and gasket mounted types for maximum pressures up to 3000 psi. The four-way and two-way threaded valves range in size from ¼ in. to 1½ in. for 2000 psi service. There is a choice of manual, cam, foot, solenoid, oil and air pilot operation and six spool styles for almost every model. Standard types of control include stem, knob, lever and a new quadrant lever locking device which offers special safety features for positive positioning.

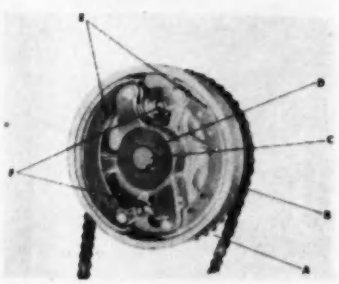
An equally complete line of gasket mounted valves from ½ in. to four in., 2000 and 3000 psi are available and rotary pilot valves are also included in the line.

Functional valves include relief, sequence, unloading, pressure reducing, counterbalance, flow control and check valves. The valves with threaded connections are available in sizes from ¼ in. to 1½ in. for 2000 psi. Flanged valves range in size from ½ in. to 2½ in. for 3000 psi; gasket mounted valves from ½ to 2½ in. for 2000 and 3000 psi.

Classifying the valves as to body style and pressure range, catalog 801 covers 2000 psi valves with sub-plate connections, catalog 821 covers 3000 psi valves with flange connections and catalog 841 covers 3000 psi sub-plate valves. Catalogs are available by writing *Hydraulic Power Div., The Hydraulic Press Mfg. Co., Lincoln Ave., Mount Gilead, Ohio.*

Friction Clutch

A new design safety friction clutch has been developed and patented. Originally designed for washing, pickling, drying, and phosphatizing machines, the safety friction clutch was made available to accommodate other manufacturers.



Metalwash safety clutch.

Drive sprocket A is bolted to drum B. Complete assembly of drum and sprocket floats on driven shaft C. The Spider D is fastened to the shaft by means of a key. Brake shoes E are pivoted at one end to the spider. At the opposite end of each shoe, the adjustment clevis F holds the shoe in place and is guided by a hole in the spider. The shaft of this clevis is threaded and is equipped with a nut, washer and spring.

Power is transmitted through a roller chain to the sprocket through the brake shoes and the spider to the driven shaft.

A slight adjustment of the nuts on the adjustment clevises gives sufficient pressure against the drum to carry extremely heavy loads. Regardless of the load, however, the slightest overload will cause the clutch to slip until the obstruction is removed. *Metalwash Machinery Corp.*

Circle 68 on postcard for more data

Plasticizer

Plasticizers for use in vinyl and other plastics are described as having low temperature flexibility and low volatility. Dutch Boy plasticizers are added to the line of stabilizers previously offered. *National Lead Co.*

Circle 69 on postcard for more data

Fast Dryer

Quick-X enamel-type coating when applied as directed to floors, walls or machinery will dry to the touch in 20 minutes. The product can be applied as directed to wood, concrete, terrazzo, magnesite and mosaic tile floors and walls, or with proper primer to metal. It dries to wax-like gloss, unaffected by cleaning compounds, soaps and detergents, and resistant to grease, oil, gasoline, alkali and salt water. *Steelcote Manufacturing Co.*

Circle 70 on postcard for more data

Vinyl to Metal Bond

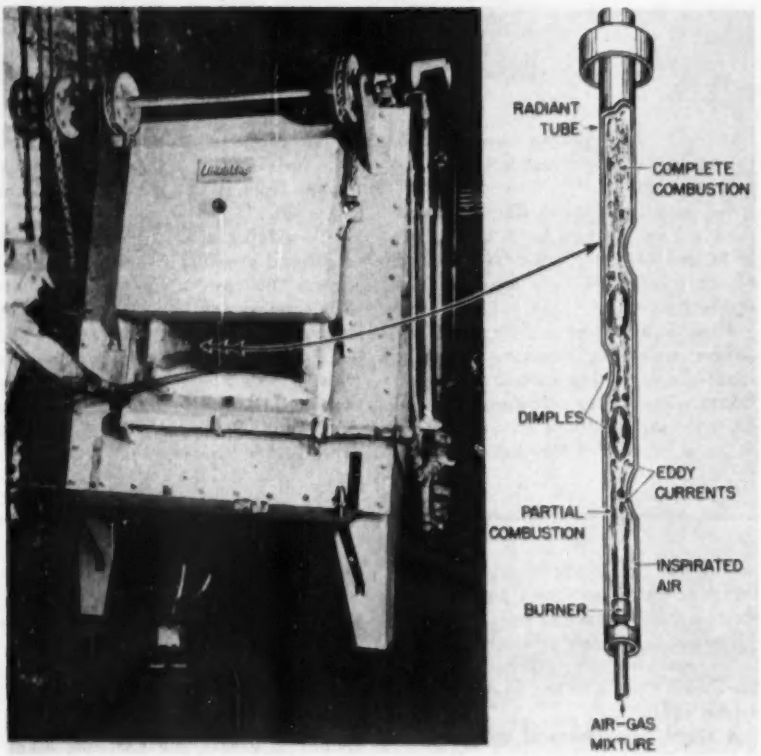
A process for bonding vinyl plastic on metal sheeting—steel, aluminum, magnesium, or copper has been perfected. The resulting material, called Sullvyne-Clad Metal Laminate, is post-formed into the finished product. It may be bent, drawn, stamped, crimped, or punched without destroying either the vinyl or its bond. Seams may even be welded to form air-tight, gas-tight closures; after weld is completed, minor repairs to the vinyl at the point of weld completely reconstitutes the liner and lamination at that point. *O'Sullivan Rubber Corp.*

Circle 71 on postcard for more data

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 73

Radiant Tubes for Atmosphere Furnace

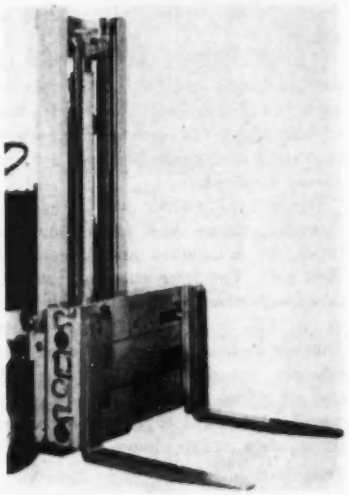


What is claimed to be the first large scale application of radiant tubes to toolroom-size furnaces is suited for heat treating virtually all production and tool steels except high-speed. Problem of too short, hot flame was solved with rich gas-air center stream, and fins inside tube to mix gas-air mixture with surrounding air as required. Inconel tubes are suspended vertically. (Lindberg Engineering Co.)

Circle 72 on postcard for more data

Clamping Forks

Special forks that adjust hydraulically from side to side are ideal for operations where a fork lift must be used alternately as a clamp truck and a fork truck. These hydraulically adjustable forks also speed handling when different widths of pallet loads must be handled. The entire clamp operating mechanism can be detached easily, should standard forks be required. *Towmotor Corp.*



Towmotor hydraulically adjustable forks bolt directly onto the support plates of the standard clamp operating mechanism.

Circle 74 on postcard for more data

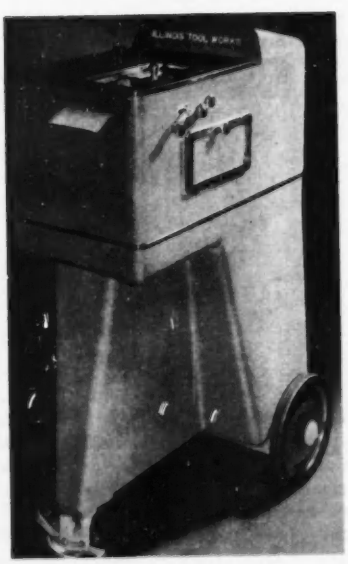
Recorder Inspects Graphically

A universal electrical recorder which produces a permanent, easy-to-read record is designed to equip analytical measuring machines and hob and worm lead machines for electrically recorded charts.

The true condition of an inspected surface is said to be more accurately revealed on the machine's recorded chart than by numerical data alone. A recorded graph will reveal, by the nature of its pattern, the cause of errors whereas figures representing indicator readings can tell only the magnitude of these errors.

A principal feature of the overall design is the unique three point pivotal base with cutout to allow the operator to stand close to the machine during operation. To help reduce vibrations transmitted through the floor, and to provide greater movability, a rubber wheel is mounted at each pivotal point. *Illinois Tool Works.*

Circle 73 on postcard for more data



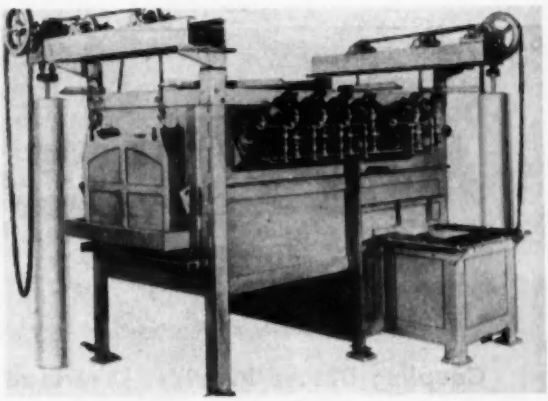
The ITW model 1603 electrical recorder.

Melting Furnace

A dry hearth double-chamber melting furnace for quality melting, die casting, or permanent molding of aluminum parts requiring a minimum of porosity features separate melting and holding baths in a single unit, thus eliminating use of containers. Furnace has a high melting rate and uniform pouring temperature. Production per square foot of floor space is claimed to be 50 per cent higher than that obtained with crucible furnaces, with fuel consumption 40 per cent lower.

Aluminum is charged through the door into the sloping hearth. Hearth in melting area is designed to allow molten aluminum to flow into the holding compartment. Two dip vestibules permit easy dipping. Cold metal cannot enter the hot bath. Design eliminates gassing of metal. Furnaces are available in 12 standard sizes up to 2000 lb per hr capacity, for gas, oil or combination gas-oil firing. *Eclipse Fuel Engineering Co.*

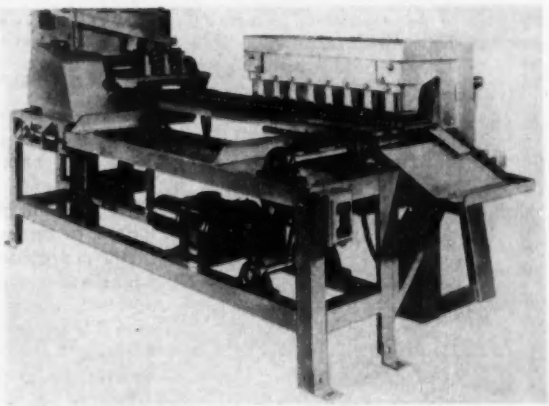
Circle 75 on postcard for more data



Eclipse melting furnace without containers.

Bar Stock End-Heating Made Automatic

End-heating bar stock for upsetting is put on a completely automatic basis with a mechanical hopper-feed unit designed to be mounted at one end of the Roto-Flame Furnace conveyor. Bars are carried through the heat zone at a speed to satisfy the desired heating cycle. Production capacity of one installation based on a Model 10-D Roto-Flame Furnace with a 39 in. heat zone, and heating two in. of the end of ⅝ in bar stock, is 600 pieces per hr. (Gas Appliance Service Inc.)



Circle 77 on postcard for more data

Controls Load Cells

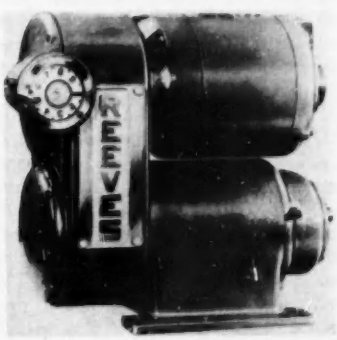
A low-cost controller unit provides on-off or high-low control action in response to forces, weights, pressures, or torque measured by means of SR-4 load cells, pressure cells, and torque pick-ups. PTL controller is operated in conjunction with the recently developed PTL amplifier and is recommended where simplicity is important, available space is small, and accuracies of two to five per cent are satisfactory. Two controllers may be used with a single amplifier. *Baldwin-Lima-Hamilton Corp.*

Circle 76 on postcard for more data

A single-pole double-throw relay can be adjusted to trip anywhere over zero to 100 per cent of full scale, as provided by the pointer knob.

Drive Redesigned

Redesigned fractional-hp Vari-Speed Motodrive units are available in 1/4, 1/3, 1/2 and 3/4-hp sizes in speed ranges

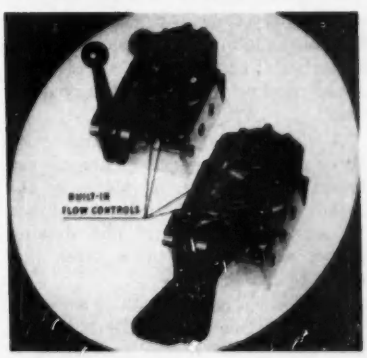


from 2:1 to 10:1. Smaller variable speed unit is available in 112 different assemblies, in horizontal and vertical models and 45 deg models and with vertical down output shaft. Speeds from three to 4660 rpm are available. Threaded spiral groove lubrication system with overflow protection is feature. (Reeves Pulley Co.)

Circle 78 on postcard for more data

Metered Valve

A hand and foot operated four-way valve features built-in, full-capacity flow-control meters of the Venturi type. An air and



low-pressure hydraulic valve, it is specifically designed for the control of double acting air or hydraulic cylinders. Line-pressure variation will not affect valve function. Capacity is up to 150 lb. (Airmatic Valve, Inc.)

Circle 79 on postcard for more data

NEW EQUIPMENT PLANT • PRODUCTION

For additional information, please use postage-free reply card on page 73

Coupling Device Provides Overload Protection

Adjustable Torque Limiter-coupling units that provide overload protection for a wide variety of machinery drives with direct-connected shafts are now available. Combining the features of an adjustable slip-clutch overload device with those of a flexible coupling, the units are ideally adapted to motor drives with torque loads up to 130 or 260 ft-lb which include a direct-coupled motor or motor and speed reducer combination. In drives of this type the Torque Limiter-coupling unit connects the motor shaft or the output shaft of the speed reducer with the primary drive shaft.

The new Morse No. 5 Torque Limiter-coupling unit that provides overload protection for a wide variety of machine drives with direct-connected shafts.

A flat molded friction disk with three integral lugs is clamped between two steel driving plates by the action of a Bellville spring tensioned by an adjusting nut. The driving plates are splined to a steel hub keyed to the shaft.

Flexible coupling action is achieved by meshing the lugs on the OD of the disk with a slotted steel cup which is keyed to the shaft. This slotted lug and cup combination permits the units to function properly independent of minor misalignment errors between driving and driven shafts.

When machine drive overload conditions cause the torque setting of the Torque Limiter to be exceeded, the friction disc breaks away from the driving plates and will then slip at from ⅛ to ⅓ the torque setting. *Morse Chain Co.*

Circle 80 on postcard for more data

Non-Ferrous Finishes

Development of new protective coatings for zinc, copper and aluminum have been announced. With Iridites No. 4-73 and No. 4-75 (Cast-Zinc-Brite) no mechanical finishing is required to produce a luster, since the luster is provided by the chemical polishing action of the Iridite solution. In addition, the resultant finish can be used as a preparation for electroplated finishes, if desirable, by chemically removing the protective film.

Iridite No. 17-P (Cupreous-Kote) provides greater corrosion resistance and paint adherence for copper and copper alloy surfaces than can be obtained from Iridite No. 7, primarily a chemical polishing solution. It will perform satisfactorily on any copper or copper alloy without generating smuts and also provides protection for soldered joints. The basic coating resembles the base metal in appearance and can be dyed yellow, red, orange or green for color identification purposes.

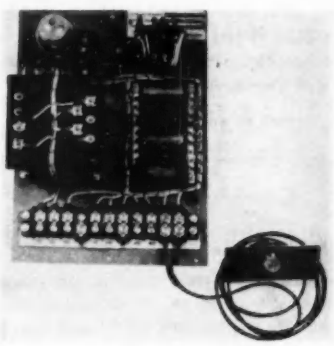
Iridite No. 14-2 (Al-Coat) operating conditions can be controlled to produce a finish ranging in appearance from yellow-iridescent to a uniform deep brown. The deep brown finish is more protective than other Iridite treatments for aluminum, and can also be more uniformly dyed. The coating can easily be bleached to produce a highly protective film with a clear-type appearance. Like all Iridite finishes for non-ferrous metals, the products are applied by a simple chemical dip, without electrolysis and without the need for special equipment or specially trained personnel. *Allied Research Products, Inc.*

Circle 81 on postcard for more data

Water Saver

A water saver control for resistance welders is automatic in operation, starting the water flow as soon as the welder begins a sequence. If the welder sequence is not repeated after three minutes, the water is shut off and a neon panel light is lit. The electrical signal for the control comes from the welder air valve in most applications, although the control may be used with any type of welder where a solenoid valve or other electrical circuit is energized for each operating cycle. *Taylor-Winfield Corp.*

Circle 85 on postcard for more data



T-W water control

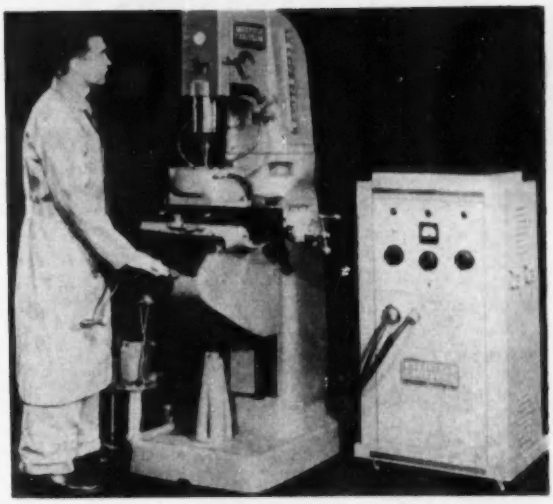
Air-Cooled One-Tonner

The 2000-lb capacity Chore Boy platform truck, model CB-20, is powered by a heavy-duty two-cyl air-cooled engine rated at 13.6 hp. Features include: Quick-change clutch . . . can be changed in thirty minutes; differential hypoidal gears; hydraulic brakes, fully enclosed, self-adjusting in both drive wheels; dead man brake; and a choice of pneumatic or cushion tires (cushion tires increase deck load capacity to 3500 lb). (The Buda Co., Div. of Allis-Chalmers Manufacturing Co.)

Circle 83 on postcard for more data

Cutter Vibrates to Make Holes in Hard Materials

The Trail Blazer model Cavitron ultrasonic high precision machine tool can accurately produce holes as small as 0.012-in. in diameter or slots of that width, in the hardest materials. It will sink blind, through, tapered or curved holes of almost any desired shape and depth; engrave or type matrix dies; cut keyway and oil holes; machine serrated roof forms of jet turbine blades; and perform countless other operations that could be accomplished in no other way. Repetitive accuracy in producing identical parts is said to be unmatched. An inexpensive tool such as soft steel is used to cut hard or brittle materials, either ferrous or non-ferrous, including those which are non-magnetic and non-conductors of electricity. The tool head vibrates from 18,000 to 30,000 cps, while a pump provides a continuous flow of abrasive grit in solution over the work surface. Extremely fine finishes are obtained and there is no local heating or electrical burning of the work or chemical or physical change in the work piece. *Sheffield Corp.*



The Cavitron ultrasonic hole and slot cutting machine

Circle 84 on postcard for more data

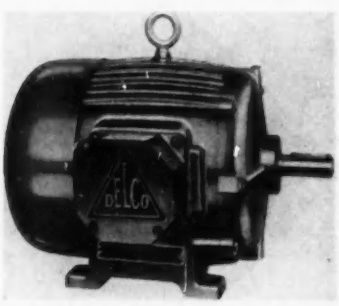
Squirrel Cage Motor Line

A line of a-c squirrel cage induction electric motors, in frame sizes from 182 through 326, have been manufactured to meet the new NEMA standards on re-rated frame sizes and represent a major stride in electric motor design with less waste space, lower noise level and less weight.

The open drip proof motor features cast iron main and end frames, aluminum die cast rotors, and grease lubricated double shielded ball bearings.

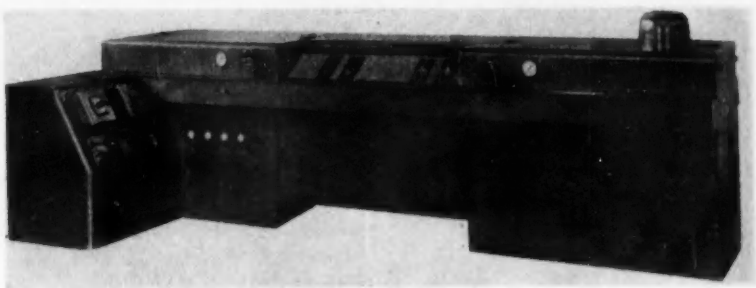
The totally enclosed fan cooled motor is built with sturdy ribbed frame construction which allows the external fan to direct air efficiently over the smooth ribbed frame. Cooler operating temperatures are obtained with the new design and cleaning problems and negligible. *Delco Products Div., General Motors Corp.*

Circle 82 on postcard for more data



The Delco totally enclosed fan cooled motor in the new NEMA standard

For Faster Decorative Spraying



Spray decorating machine by Comforming Matrix

An all-electric automatic spray decorating machine with an integrated mask washer accommodates spraying of large or small parts.

Mask washing one set of masks takes place in this traversing gun machine during the painting operation and without the necessity of removing masks. The operator merely throws a switch and immediately clean masks are shuttled into position for painting. Only four marks are required, two in use and two in the washer. The machine can also be designed for two operators, employing eight masks. Machines in use are producing 2400 pieces an hour per operator, painting on both the forward and return stroke. Where the guns paint on stationary the machine can be made to cycle up to 3600 per hour.

The mask washing continues even though the painting operation is momentarily suspended, making sure that the masks are always clean when work is resumed. The wash cycle is dial controlled up to two minutes. The wash pattern is very flexible and adjustable to insure adequate cleaning of both the top and bottom side of any specific mask. Mask washing is accomplished by a high pressure system with a series of non-clogging nozzles arranged on ports set on ½-in. centers.

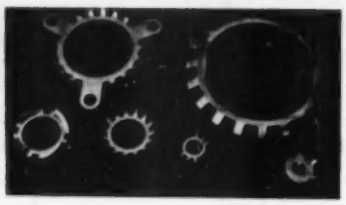
Air passed across the work is filtered. After the mask is washed and before it is returned to painting operation, a jet of clean air removes all remaining moisture.

When painting with two colors, the atomized air and the guns are controlled separately for each color, due to the various viscosities of different paints. *Conforming Matrix Corp.*

Circle 86 on postcard for more data

NEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

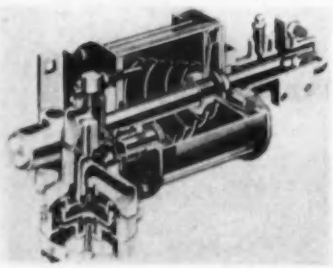


Custom Die-Cut Lock Washers

Custom made die-cut lock washers in small lots, without the cost of conventional blanking and piercing dies, are now available. These special lock washers can be produced from practically any sheet metal stock, including cold rolled steel, spring bronze, spring steel and any other sheet alloys. The average die cost, under the new process, runs from about 10 to 20 per cent of the cost of conventional tooling.

Special lock washers for shaft sizes from ⅛ to six in. are available. *Dayton Rogers Mfg. Co.*

Circle 36 on postcard for more data



Power Brake for Passenger Cars

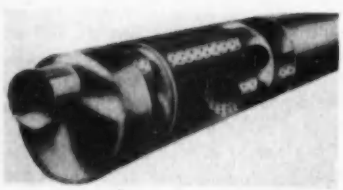
A new power brake designed exclusively for passenger cars is the manufacturer's latest entry in the field of automotive equipment. The Feather Touch power brake is said to feature unusual compactness and simplicity of design. The cutaway drawing shows details of the valving. The unit is easily installed, and fits all popular makes of automobiles. *Marvel-Schebler Products Div., Borg-Warner Corp.*

Circle 37 on postcard for more data

Tapping Screws with Balanced Edges

Three types of thread cutting screws with two balanced cutting edges offer the following advantages over conventional type cutting screws: Balanced cutting edges—requiring less driving torque; wider flutes—solid connection gives a stronger tip to permit wider flutes for increased chip room; alloy steel—heat treated; and vibration protection. Three types are designed for use in steels, alloy steels, and cast iron; for die-casting use; and for low driving torque with high stripping torque in plastics. *Continental Screw Co.*

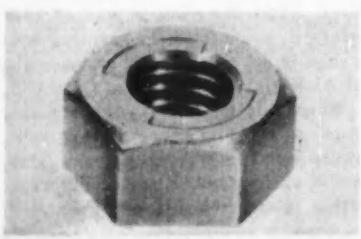
Circle 38 on postcard for more data



Heavy Duty Mufflers

Tough Duty mufflers for heavy gas and Diesel trucks feature all internal parts, including inlet and outlet tubes and all internal supports, of heavy gauge aluminized steel. This steel defies the 1250 F heat and the corrosive action of water and acids. Tuning chambers that filter out high frequency noises and modify low frequency sounds. The muffler also features domed end caps to prevent moisture condensation on vertical mounts. *Maremont Automotive Products, Inc.*

Circle 39 on postcard for more data



Lock Nut Line Revealed

The "M-F" Uni-Torque Lock Nut, principal product of the newly-formed industrial division of the firm, is a reusable stop-type semi-finished nut in which part of the top threads are deflected out of their true helix. It is now being made available in 18 sizes in three styles (standard, high and jam). *MacLean-Fogg Lock Nut Co.*

Circle 40 on postcard for more data

Free INFORMATION SERVICE

Postage-Free Postcards Are Provided Here for Your Convenience to Obtain FREE LITERATURE and Additional Information on NEW PRODUCTION AND PLANT EQUIPMENT, AND NEW PRODUCTS Described in This Issue of AUTOMOTIVE INDUSTRIES. Please Circle Code Numbers of Items in Which You Are Interested, Print Name, etc., and Mail Promptly for Quicker Service.

USE THIS POSTCARD

FREE LITERATURE

Pallets 1

Steel pallets, double face, semi-double face, and single face, are described in a folder available from *Republic Steel Corp., Pressed Steel Div.*

Prices 2

A price list covering its complete line of stock cylinders for immediate delivery is now available from *Miller Fluid Power Co.*

Adhesive Specs 3

An up-to-date list of 3M adhesives, coatings and sealers meeting government specification requirements is contained in a pocket sized booklet issued by the *Adhesives and Coatings Div., Minnesota Mining and Manufacturing Co.*

Titanium Tubing 4

Properties, applications and advantages of titanium tubing are presented in bulletin No. 42 offered by *Superior Tube Co.*

Special Trucks 5

Application of specially-designed industrial trucks for unusual loads, including 12 case histories, is the subject of a brochure just issued by the *Elwell-Parker Electric Co.*

Instruments 6

Composite catalog No. 5001, with many new features, contains brief descriptions of all Brown instruments. *Minneapolis-Honeywell Regulator Co.*

Silicone Rubber 7

Silastic Facts 9-334 briefly describes 30 of the most popular silicone rubber stock and paste raw stocks, giving leading characteristics, useful temperature range, suggested applications and recommended fabrication methods. *Dow Corning Corp.*

Cutting Oils 8

Cutting Oil Bases details four principal oil bases prescribed for tapping, threading, broaching, gear hobbing, automatic screw machine and turret lathe work on a wide variety of metals. *D. A. Stuart Oil Co., Ltd.*

Check Vibration 9

Relationship between vibration phenomena and precision manufacturing is pointed out in 16-page brochure, Form G-1, covering the advantages of portable vibration analysis equipment. *International Research and Development Corp.*

(Please turn page)

VOID After Sept. 15, 1954 7/15/54

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41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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Bins, Reels, Trucks 10

A new 48-page catalog of materials handling equipment covers steel boxes with lap joints, a stand and reel for handling steel coils and a new type nesting stacking box, a skid box with a side door which provides easy access to materials without removing stacked boxes, and many others. *Palmer-Shile Co.*

Two-Spindle Lathes 11

Bulletin No. 128 describes and illustrates the 5-D2 Power-Flex two-spindle 9, 12 and 15-in. automatic turret lathes. *Potter & Johnston Co.*

Plan Panelboards 12

Planning commercial and industrial circuit-breaker panelboards, including advantages of De-ion circuit breakers and of the dead-front breaker panel, discussed in 16-page booklet B-6098. *Westinghouse Electric Corp.*

Quick-Seal Coupling 13

A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines, which provides permanent freedom from leakage, is described in a bulletin just published by *Titeflex, Inc.*

Airless Blast 14

Blast cleaning by airless means in a tumble-type machine is the subject of bulletin No. 114-B, describing specifically the 11½ cu ft capacity Tumblast model, as well as describing in general the advantages of the airless blast cleaning process. *American Wheelabrator & Equipment Corp.*

USE THIS POSTCARD

Plating Equipment 15

A 24-page general catalog pictures and describes a complete line of platers' equipment. Full automatic plating machines included are: return type, straight lines, rotaries and juniors. Barrel plating equipment and accessories are included as well as electrical equipment, filters, dryers and a listing of processes and supplies. *The Udylite Corp.*

Friction Data 16

A 44-page book covering friction materials in special shapes, Engineering Bulletin No. 500 lists over 50 asbestos brake linings and blocks, 31 clutch facing materials, and 19 sintered metal materials with description of service conditions under which each will operate. Also design data on selection of materials for oil and dry applications. *Raybestos-Manhattan, Inc., Equipment Sales Div.*

Trailer vs. Aisle 17

How Trailability Determines Tractor-Trailer Aisle Widths is the subject of a folder offered by *Mercury Mfg. Co.*

Grinders 18

A catalog on Type B hydraulic surface grinders, sizes from 6 in. by 18 in. to 12 in. by 120 in., contains complete features and specifications with location of all main controls, clearance drawings and wheel sizes. Catalog B-53. *The Thompson Grinder Co.*

Pyrometers 19

Catalog 9301 covers the four types of Radiamatic radiation detectors for measuring temperatures from 125 to 7000 F. *Minneapolis-Honeywell Regulator Co.*

Precision Gyro 20

The MA-1 compass system for aircraft, with a free-gyro drift rate of four deg per hour, is described in booklet GEA-5998. *General Electric Co.*

Parts Handling Baskets 21

Now offered is a bulletin on the line of Eezy-Stak parts handling baskets. The bulletin, No. B-54, describes a complete line of standard and custom-engineered baskets. *Wire & Iron Products, Inc.*

Investment Casting 22

How investment casting gives new design freedom is the subject of a recently published brochure. Several commercial and military parts are described and illustrated. *Howard Foundry Co.*

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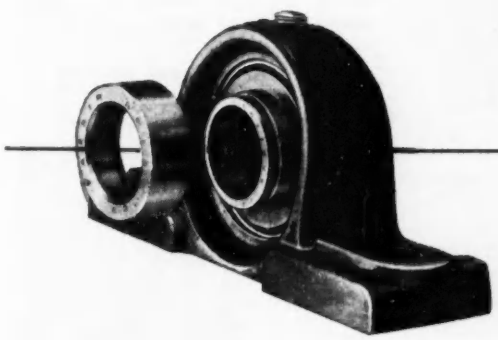
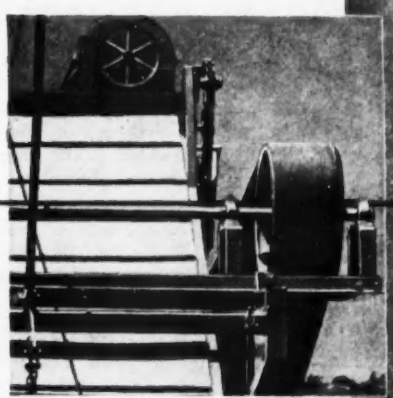
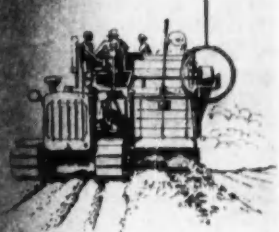
The Engagement Ring makes it positive



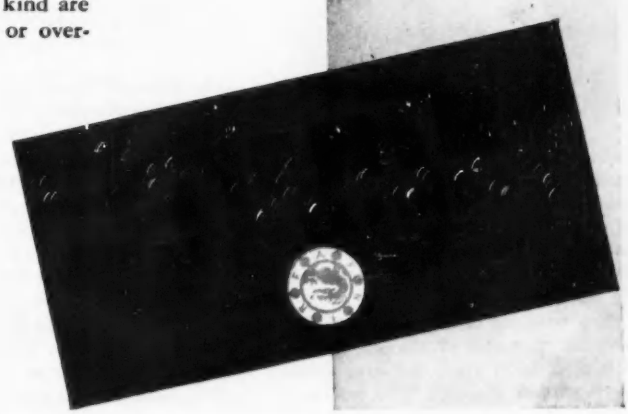




When important shafts on farm machinery and Fafnir Wide Inner Ring Ball Bearings become engaged . . . there's never any question about shaft slippage. The engagement ring, known as the Fafnir originated Self-Locking Collar, makes the union positive beyond a doubt.

In the design of the Self-Locking Collar, you'll find the reason for this positive action. The collar is machined as a mating eccentric cam to the wide inner ring of the bearing . . . and it is counterbored too. A quarter turn of the collar on the inner ring assures positive locking action between bearing and shaft. No set screw, lock nuts or adapters are needed. No adjustments of any kind are necessary and the bearing cannot be cramped or overloaded in mounting.

For straight shaft mounting, the Fafnir Wide Inner Ring Ball Bearing with Self-Locking Collar continues to rate "tops" as a feature of power transmission units. Its positive-engagement, *plus* simplicity-of-mounting, *plus* efficient seals are features that lead to savings in design, assembly and maintenance. Are you taking advantage of them? The Fafnir Bearing Company, New Britain, Conn.



NEW AIRCRAFT PRODUCTS

FOR ADDITIONAL INFORMATION, please use postage-free reply card on PAGE 73

Robot Tests Controls

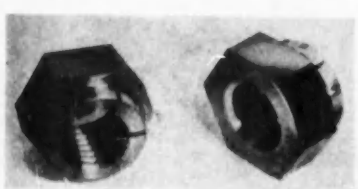
A sensitive robot hand that can function more delicately than a human hand at distances ranging from 12 in. to 1000 ft, was developed to operate remotely located control of reciprocating aircraft or automotive engines during test work. The electronic remote positioning system is said to be 100 times more responsive than conventional or hydraulic systems previously used for this function.

The system is composed of an electronic amplifier and balancing motor, standard in industrial pyrometers, and two resistor elements. It eliminates the tendency of the conventional adjusting system to have backlash or play in operation. This system may also be modified to permit actual vehicle or aircraft installations so that tests can be conducted during regular use. *Industrial Div., Minneapolis-Honeywell Regulator Co.*

Circle 46 on postcard for more data

Engine Nut

Series 32FE engine nuts added to the Flexloc line of self-locking locknuts are designed for aircraft or automotive engine use where temperatures do not exceed 550 F. The engine nut is distinguished from the



standard Flexloc by an integral metal washer face on the seating side of the nut. This washer face—a circular collar about 1/32-in. thick—can be machined to much closer tolerances than the full seating face of a standard nut.

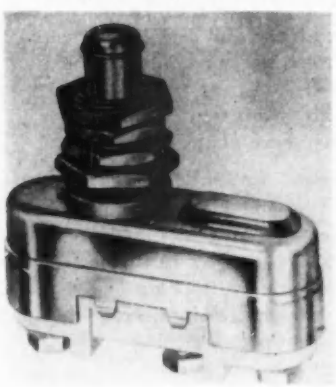
Squareness of the washer face with the pitch diameter of the nut is held to within 0.005 (full indicator reading) on sizes through 7/16 in.—and to within 0.006 on the ½-in. diameter nut. This permits more accurate alignment and seating in conformance with aircraft engine specifications.

The series is being made in sizes ranging from 0.190 to 0.500 in. diameter. National Fine threads are made to new unified tolerances. The nuts are AMS 5024C alloy steel and are cadmium plated for corrosion protection.

The one-piece, all-metal engine nuts, like other members of the Flexloc family, are stop nuts as well as locknuts; they lock in place at any point along the bolt or stud, whether seated or not. *Standard Pressed Steel Co.*

Circle 47 on postcard for more data

High Temp Switch



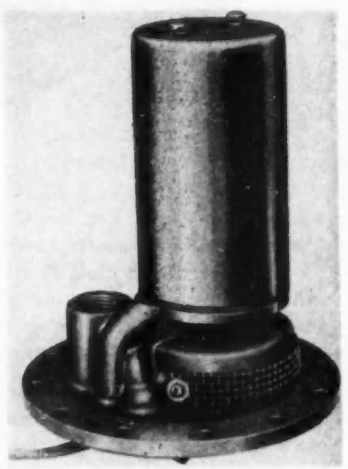
A precision switch for high-temperature applications, designated IHTI, has capacity for switching a substantial electrical load in a temperature range of minus 50 to 1000 F, equally well suited for high-temperature aircraft and industrial applications.

Laboratory tests at 700 F show life in excess of 25,000 operations at a resistive load of five amp 28 volts d-c. At 1000 F the new switch has surpassed 9000 operations carrying a resistive load of two amp 28 volts d-c. The switch is designed for panel mounting. Two thin hexagonal nuts and two lock nuts on the threaded bushing permit adjustment of the operating point without removing the switch from its mounting. *Micro Switch, Div. of Minneapolis-Honeywell Regulator Co.*

Circle 48 on postcard for more data

Booster Pump

The series RG-11260, 1/5 hp, 27 volt dc, centrifugal fuel booster pumps supplement the maker's series of



small-size, light weight fuel booster pumps with a pump capable of high pressure and greater volume. Basic design is a centrifugal type impeller which will handle aviation gasoline or JP-4 fuel. The booster pump maintains bubble-free flow in the line between supply tank and engine, which eliminates vapor lock and permits the engine-driven fuel pump to function normally for faster rate of climb—under conditions of fuel boiling in tank surrounding the booster pump.

Capacity is based on rate of climb of aircraft of 2000 ft per minute. Pressure is maintained at 19 to 20 psi at 200 gal per hr; 20 to 21 psi at 100 gal per hr. *Lear, Inc., Lear-Romec Div.*

Circle 49 on postcard for more data

"That's all there is to mounting a NEEDLE BEARING"

Any man or woman in your plant can install a Torrington DC Needle Bearing quickly and accurately. Just a simple operation on an arbor press, and you build high capacity anti-friction performance right into your product.

The Needle Bearing is simplicity itself—its drawn and hardened outer shell, when pressed into a recommended housing bore, serves as its outer race and retains a full complement of precision needle rollers. No inner race is needed on hardened shafts. For its size and weight this unit-construction bearing has a higher radial load capacity than *any* other anti-friction bearing.

Think of these advantages for your product: Compact, efficient design . . . the Needle Bearing's small size permits reductions in the size and weight of related parts. Effective lubrication . . . the turned-in lips of the outer shell retain lubricants and help insure long service life. Low initial cost . . . you can install Needle Bearings for little more than the cost of plain bearings.

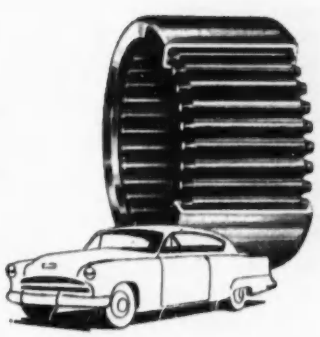
Let us show you how Needle Bearings can solve your anti-friction problems.

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.

District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON NEEDLE BEARINGS

Needle • Spherical Roller • Tapered Roller • Cylindrical Roller • Ball • Needle Rollers



America's leading automobile makers use millions of Torrington Needle Bearings a year in steering gears, transmissions, universal joints and many other assemblies. Needle Bearings install easily, give long service life, help contribute to safer handling, smoother riding and braking to cars and trucks.

The BUSINESS PULSE

Industrial Production Takes Upturn. Recent Reports on Unemployment Insurance Claims Show Improvement in Employment Picture. Reduction of Inventories Accompanied by Increases in Sales and in New Orders

This Survey is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York

Mixed Reports

Among the most encouraging of recent reports is the upturn in the Federal Reserve index of industrial production. Another is the continued high level of construction contracts. A third is the recent improvement in automobile sales. A fourth is the rise in manufacturers' sales and new orders.

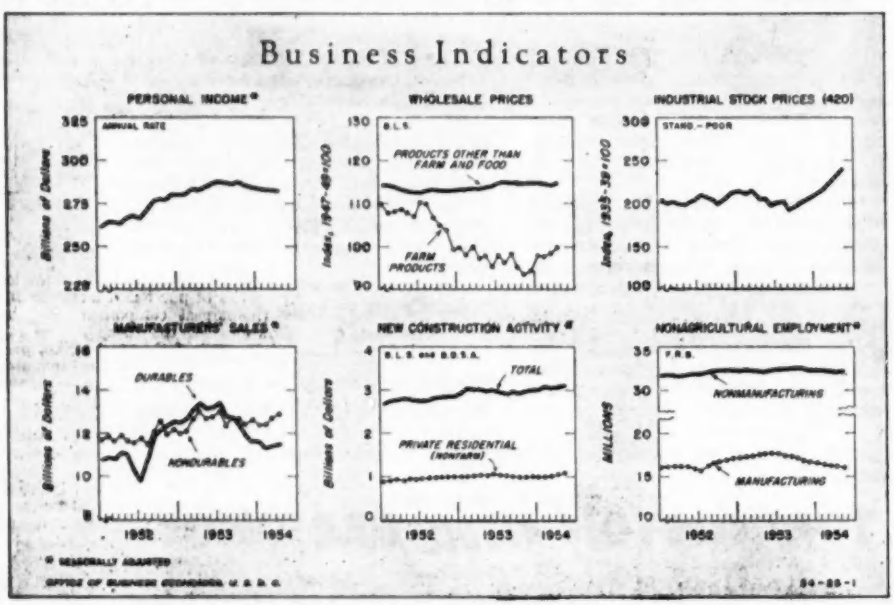
On the other side, retail trade has been somewhat less active than was hoped, although there are some signs of improvement in the latest reports. Prices have been less stable, especially those of farm products and processed foods. It appears that business expenditures for new plant and equipment are likely to continue to decline slowly, although this might be interpreted as a favorable sign, as the volume of such spending is still very large. In the construction field, the recent decline in the number of housing starts has caused some disappointment, even though it is attributed mainly to bad weather.

Only the future can determine to what extent the volume of demand has been supported by forward buying in anticipation of a possible steel strike, a possible rise in prices in the event of wage concessions by employers, and a possible further deterioration of the situation in Indo-China resulting in direct involvement of the United States. All these possibilities have been overhanging the market for some time, and their cumulative effect could be considerable. Conversely, their disappearance could have a quieting effect on demand in the weeks and months ahead.

Government Action

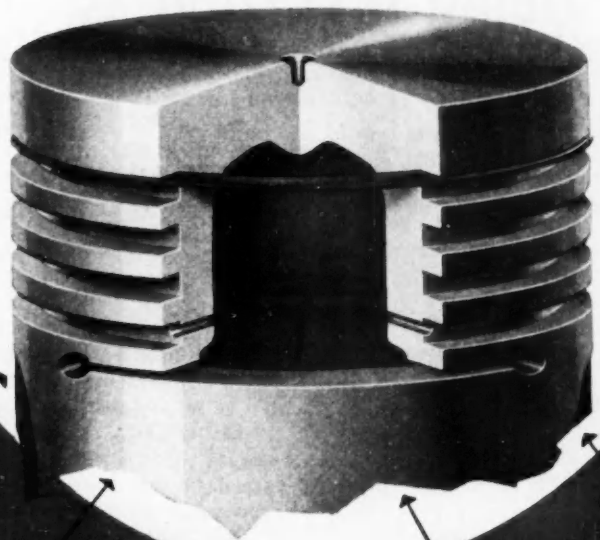
A good many forecasters seem to be of the opinion that the business decline has about run its course but that no strong recovery is in early prospect. In other words, they think the recession is rounding off into a broad bottom, which may last for some time. If this proves to be the case, the question arises as to what the Government will do, if anything, in an effort to alter the situation.

(*Turn to page* 139, *please*)



Adopted by leading engine builders

...for original equipment... for service departments



Sealed Power GI-60 Groove Insert

INCREASES PISTON LIFE TO AS MUCH AS 200,000 MILES!

Pioneered by Sealed Power engineers and proved by experience to be the only dependable, economical answer to top-ring-groove wear, Sealed Power GI-60 Contracting Groove Insert is steadily gaining in popularity with engine manufacturers.

They can't ignore the testimony of fleet owners who have reported that GI-60 has increased *average piston life* to over 200,000 in the toughest kind of service. Several engine builders now make GI-60 standard equipment in new engines. Others are using it in replacement pistons.

Sealed Power GI-60 is a heat-treated spring steel insert, securely anchored to the top of the ring groove after regrooving to a true surface 1/32" wider than before. A 1/32" recess is then cut at the top and the insert locks itself permanently into place, held by its own inward tension and dished to hug the top of the groove.

This armor-plate protection gives the top ring groove protection it can't get in any other way. This groove is in the hottest, least-lubricated spot in the piston. GI-60 resists the pounding, the heat, and the friction far better than aluminum or cast iron possibly can. That's why it adds thousands of miles of life to both new and replacement pistons... *"makes old pistons new, keeps new pistons young."*

Sealed Power Corporation

MUSKEGON, MICHIGAN

Sole manufacturers of KromeX Ring Sets, MD-50 Steel Oil Ring, Full-Flow Spring, Flex-5 Flexible Oil Ring, and GI-60 Groove Insert. Leading producer of Automatic Transmission Rings, Power Steering Rings, and Non-Spin Oil Rings

Smog and Exhaust Fumes Being Investigated

By Joseph Geschelin

LOS ANGELES has a problem. Although regional, it affects a major population area, poses some serious implications that have impelled the automotive industries, through the Automobile Manufacturers Association, to initiate a program of scientific inquiry. Smog is the problem, for want of a better descriptive term.

Now that the industry has entered the picture it is imperative for the automotive business community—motor car and truck dealers, repair shops, motor clubs, and others to exert their efforts in preventing hysteria and political pressures. Some people are proposing the use of expensive attachments to automobiles, claiming these will eliminate exhaust problems. Experts doubt their effectiveness. One medical man recently proposed the theory that lung cancer is caused by exhaust gases in the air. The plain fact is that no one knows at this writing exactly what is responsible for the present conditions, nor what to do about it.

Los Angeles is subject to peculiar climatic conditions that doubtless have been present since the Pacific Ocean emerged. Like earthquakes, hurricanes and tornadoes, it is a natural phenomenon beyond the control of man. In this case, however, it is a situation that can be aggravated by man. Before the enormous population growth and industrial expansion incident to the last war, no one paid much attention to it.

Serious Pollution Problem

Today, however, the concentration of people, the concentration of industrial plants, the growth of petroleum refineries, some two million automobiles and trucks and buses, smudge pots, some 800,000 incinerators, all have contributed to some extent to a rather alarming situation. Today Los Angeles has a serious air pollution problem. It is expressed in the form of reduced visibility under certain conditions, odors, eye smarting, and crop damage. It is the last two that cause greatest concern.

To be sure, the government of the area has been making studies of the situation for a long time. Much of this has come to a dead end, although such sources of contamination as backyard incinerators are still under investigation. More recently, the petroleum refiners in the area conducted a research program under the auspices of the Stanford Research Institute which has resulted in a major and costly effort to control evaporation and processing losses.

Since the problem still remains, attention is being turned to other avenues. Current theory engaging attention is that hydrocarbon effluents, in the presence of ozone and strong sunlight, undergo some chemical reaction responsible for the eye-irritating haze. While this theory is not proved, it is based upon strong circumstantial evidence. In fact, in the absence of conclusive evidence, it has been conceded that hydrocarbons from vehicle exhaust must have some contributing effect. How much no one knows at this writing. It may be quite negligible and unimportant. But again that must be proved.

Automotive Program

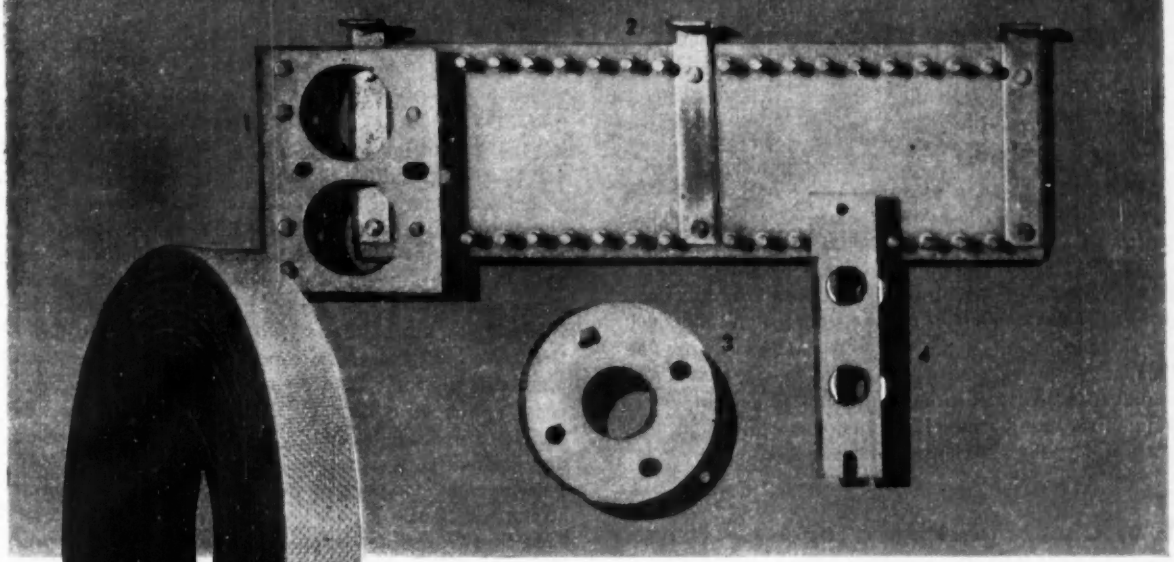
In any event, the hunt is on and the automotive industries have undertaken to do their part in the public interest. However, scientific investigations take time and a lot of money. A long range program may take five years, more or less, before any conclusive evidence can be presented.

During this period it becomes important for everyone concerned—motor car and truck dealers and repair shops, industry groups, motor clubs, and other public spirited bodies to band together and make sure no hasty or precipitous action is taken politically to penalize the motoring public. There is one example in evidence already. We are told that several organizations promoting catalytic devices and afterburners attached to the exhaust systems have made the claim that such devices will rid the atmosphere of pollution. The trouble is no one yet knows whether the motor car does contribute to the problem nor how effective this avenue would be in eliminating smarting eyes and crop damage. Moreover, experts question whether the devices thus far proposed will be effective and for how long. Meanwhile, ill-advised legislation could force

(*Turn to page* 162, *please*)

C-D-F SILICONES

For high temperature electrical insulation

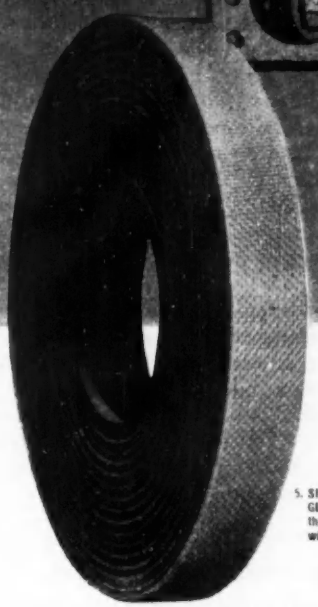


1. COIL MOUNTING—GB-112S. Machined by C-D-F; sawed to shape holes drilled, slot end-milled, large holes fly cut, characters stamped.

2. AIRCRAFT TERMINAL BOARD—GB-112S. Customer fabricated

3. SHEET WASHER—GB-112S. Punched out, characters stamped.

4. COIL HOLDER—GB-112S. Cut from sheet stock, then sawed to shape, drilled in jig, slot end-milled. Work done by C-D-F.



5. SILICONE VARNISHED FIBERGLAS TAPE made in uniform thickness, in a wide range of widths.

C-D-F SILICONE TAPES are recommended for Class H insulation. It's been proved that silicone insulation has 10 times longer life than Class B insulation, even at the temperature limits of Class H. There are two types of C-D-F Silicone Tapes and Sheets: (1) Silicone varnished fiberglas; (2) Silicone rubber fiberglas. Each has the following properties:

- High temperature resistance
- High dielectric strength
- Low dielectric loss
- Resistance to moisture
- High tensile strength
- Flexibility

Both grades meet A.I.E.E. Standard for Class H insulation. They resist mild alkalis, non-oxidizing acids, mineral oils, oxygenated soivents. Silicone rubber fiberglas is recommended for many applications requiring a flexible abrasion-resistant material with good thermal conductivity. C-D-F Silicone tapes and sheets are available in a wide range of sizes in continuous rolls. For complete details, write for Technical Bulletin #47.

C-D-F SILICONE DILECTO LAMINATED PLASTIC

Many of the parts illustrated were manufactured and fabricated by C-D-F . . . who has a wealth of experience, forward-looking engineering and modern facilities that can be put to work for you. C-D-F is a dependable source of supply for insulating materials, and is noted for its fair pricing, for producing high quality products on schedule. Why not call in a C-D-F sales engineer on your problem. Or, write for Technical Bulletins:

#25—complete data on GB-261S, a fiberglas silicone laminate made of a staple filament woven fiberglas cloth and silicone resin in sheet form; #37—covers glass base silicone metal clad laminates; #42—post-forming grade of glass base silicone in sheet form; #23—GB-112S, fine weave continuous filament woven fiberglas with silicone resin, sheets, tubes, rods, molded shapes.

See our general catalog in Sweet's Design File for more data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for technical bulletin and specific catalog, free test samples, or send us your print for quotation.

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AIR BRIEFS

By ROBERT McLARREN

Export Record

The U. S. aircraft manufacturing industry established a peacetime record by exporting $880,500,000 worth of aircraft and parts in 1953. This total is made up of $79,309,000 worth of new passenger transports; $6,953,000 worth of utility aircraft weighing less than 3000 lb; $4,873,000 worth of helicopters and $709,000 worth of aircraft engines of less than 400 hp. The balance of the exports were for military aircraft and engines which the Pentagon will not permit breaking down into categories. Best customers for civil aircraft and parts are Canada and Mexico.

World's Largest Sprayer

We are used to thinking of aerial spray and dust aircraft as small private planes or converted military trainers but Central Aircraft of Yakima, Wash., has just completed a spraying job using a converted four-engine Boeing B-17 Flying Fortress bomber. The $150,000 operation included the spraying of 40,000 acres in the vicinity of Lansing and East Lansing, Mich., to control the gypsy moth. The big bomber carried 3000 gal of a DDT-kerosene mixture in a single load.

Tiny Bomber

For a half-century the bomber has been a huge load carrier with each model larger than the last. The atom bomb has changed all that and instead of lifting a terrific tonnage, the modern bomber need lift only a single A- or H-bomb load. Although more than a dozen current aircraft can carry the bomb, the first bomber specifically designed for the job is the new Douglas A4D Skyhawk, which is smaller than most current fighters. The new carrier bomber is a delta-wing type powered by a single Curtiss-Wright J65 turbojet engine of about 7500 lb static thrust. It is now in production at Douglas El Segundo Division alongside the Douglas F4D Skyray carrier fighter, which is larger and heavier, believe it or not.

Turboprop Ready

Allison and the Navy have never made a secret of the fact that the company's T40 turboprop engine has been a headache for several years. It is because of engine difficulties that a major production program for the Douglas A2D Skyshark was shelved and serious discussions were held a year ago over changing the engines in the big Convair R3Y Tradewind flying boat. Now, however, both Allison and the Navy are firm in their announcement that the big T40, which develops 5500 hp, has licked all its bugs and is now ready for quantity production. As usual, the difficulties have been traced to policy decisions rather than any inherent fault in design. It was decided several years ago that, as a policy, the engine should be controlled by a single handle. This led to a two-three year development program on a complex electronic control system, some components of which had not even been attempted at the time. This entire system has now been thrown out and simple, mechanical controls substituted. Other similar mechanical systems, including a decoupler which uncouples one turbine from the two-turbine engine, and a mechanical-hydraulic clutch, have eliminated difficulties and produced a simple, reliable engine. The T40 powers the two (Lockheed XFV-1 and Convair XFY-1) vertical take off fighters and is available for civil heavy transport use.

Navy Trainer

After a year of exhaustive tests and studies, the Navy has announced that Beech Aircraft Corp. is winner of the training plane competition. Winning entry is the T34 Mentor monoplane, already in production for the Air Force and being tooled for production in Canada and Japan. The $9 million contract will require two years to complete and will undoubtedly be extended by additional orders in the future. Chief element in favor of the Mentor is its low cost, both purchase and operating. Its 225-hp Continental engine will permit the Navy to train pilots at less than half the direct flight-hour cost of the war-weary North American SNJ types with 600-hp Pratt & Whitney Wasp engine now being used.

Interchangeable Assembly

Although the automobile builders have been doing it for years, the aircraft manufacturing industry is now delivering its first aircraft intended for assembly at a distant base. The Martin B-61 Matador pilotless bomber is shipped from the plant in seven crates and

(*Turn to page* 122, *please*)

SPEED SENSITIVE Switches

Model GH-3

Model GS-3

Synchro-Start has re-designed its line of SPEED SENSITIVE CONTROLS in one, two and three switch units so that they will give still longer life, better accuracy and be more economical to build.

These speed sensitive switches are available in two body designs. The GS series is adaptable to standard distributor take-off to accommodate gear or coupling drives and the rotating parts run in oilless bronze bushings. The GH body design is for standard SAE tachometer drive and runs in oil sealed ball bearings, lubricated for life.

These units contain three snap action switches rated 10 Amps.-110 Volts A. C. activating three individually adjustable switches to make or break a circuit at any RPM. All three switches are activated at any desired speed and can be had with adjustable automatic re-set of manual switch.

The models shown here automatically perform three different speed sensitive operations at any desired RPM.

Write us for the correct model for your installation.

Synchro-Start Products Inc.

Mfrs. of Automatic Engine Controls Since 1932

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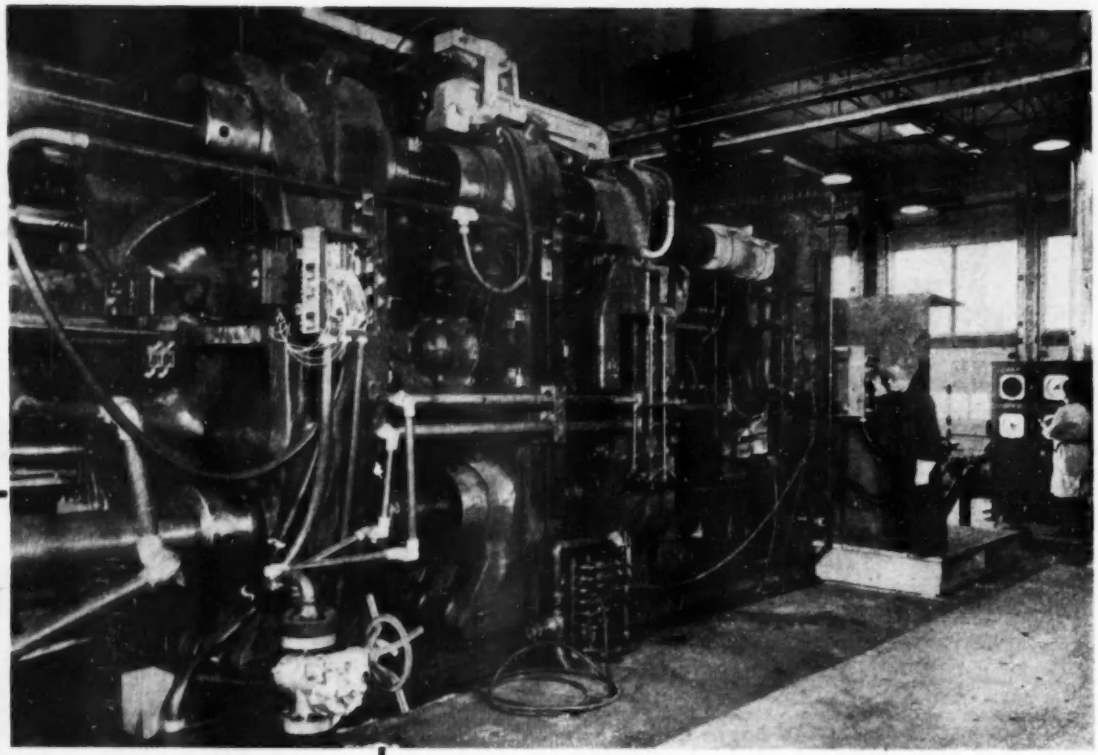


Side view of 72 in. die casting machine

SPECIFICATIONS FOR 72 IN. DIE CASTING MACHINE

Size of die plates (in.)	105 by 105
Diameter of tie bars (in.)	12
Number of tie bars	4
Tie bar centers (in.)	72
Minimum die space (in.)	36
Maximum die space (in.)	66
Minimum die opening (in.)	20
Maximum die opening (in.)	36
Locking pressure on die (tons)	2,000
Shot cylinder diameter (in.)	8
Injection pressure on metal (psi)	6,200
Line pressure (psi)	3,500
Weight of machine (lb)	430,000
Floor space for machine only (ft)	10 by 44

Largest Die Casting Machine

THE largest die casting machine ever built was unveiled June 29 by the Doehler-Jarvis Div., National Lead Co. at its Toledo Plant 2. Designed primarily for aluminum alloy die castings and with the automotive market specifically in mind, the machine was conceived about five years ago and developed as a joint project of Doehler-Jarvis and Kaiser Aluminum & Chemical Corp.

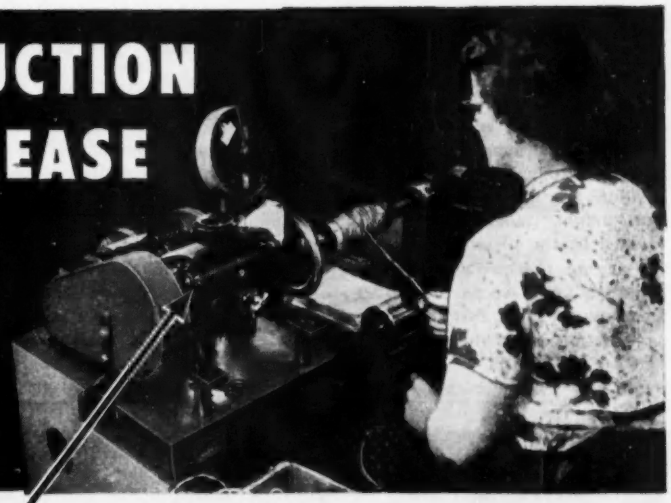
Characterized as a 72-in. machine, i.e., 72 in. between the centers of the four enormous tie-bars that constitute the framework, it has a locking pressure at the end of the tandem-toggle stroke estimated at 3000 tons. Because of its patented tandem-toggle construction, the machine has a die opening of 40 in., is capable of making aluminum die castings up to 1500 sq in. in projected area and weighing up to 75 lb. Although it is intended primarily for aluminum die castings, zinc die castings weighing up to 200 lb also can be made.

It is estimated that castings weighing up to 75 lb in aluminum can be made at the rate of 30 an hour, consuming in excess of 2250 lb of metal per hour.

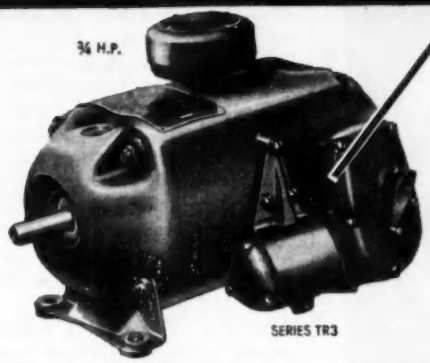
Of interest to automotive designers and management is that the availability of this enormous equipment now makes it feasible to think and plan in (*Turn to page* 168, *please*)

18% PRODUCTION INCREASE

Maintenance Practically Eliminated



Winding TV power transformer coils at Sparton Radio-Television



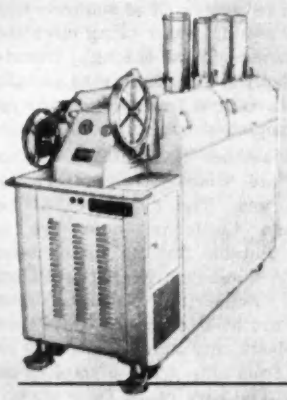
VICKERS

VARIABLE SPEED Hydraulic Transmission

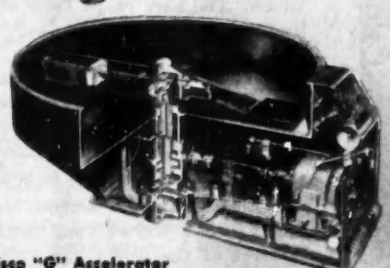
Hourly production was increased 18% when these coil-winding machines at Sparton Radio-Television were equipped with the Series TR3 Vickers Variable Speed Hydraulic Transmission. This improvement resulted from the superior control features inherent in the transmission: (1) extremely quick and smooth variations in speed, (2) maximum torque at low rpm, (3) instantaneous starting and stopping.

While the previous drives required maintenance approximately once a week, the Vickers transmissions have needed attention only three or four times since they were installed four years ago. They have built-in automatic overload protection and they are automatically pressure lubricated by the power-transmitting medium (oil).

Perhaps you have an application where this Vickers Variable Speed Hydraulic Transmission will make similar improvements and economies. Ask the nearest office listed below for Bulletin 47-40a.



Motion Picture Film Processing Machine By Houston Fearless Corp.—Another application where stepless variable speed and constant torque of Vickers Hydraulic Power Transmission provided much more satisfactory operation.



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6486

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Latest Trends in Hot Rods

(Continued from page 56)

modified engines are classified by a piston displacement - to - weight ratio. In this division, the class for an individual car is determined by the actual weight (measured at the strip) divided by the piston displacement of the engine, power output in this case being an unknown factor. With such a system of rules, fair and very close competition is provided for all types of cars.

The short strip enthusiasts have conceived a completely new, different and very specialized machine, known as the "dragster." This type of car is built to start from a standstill and travel a quarter-mile in the fastest possible time. With such a car, light overall weight and correct weight distribution are essential factors. The laden weight of a dragster may be as little as 1100 lb, resulting in an actual power-to-weight ratio of about 4½ lb per brake hp. Elapsed times over a standing start quarter-mile have been very accurately clocked at slightly over 10 seconds with top speeds at the end of the quarter in excess of 142 mph!

In a typical dragster, the driver is located over or just ahead of the racing type quick-change rear axle assembly. He straddles the manual shift transmission, which is stripped of all gears except for two forward speeds, usually second and high. The engine is as close to the rear wheels as possible, resulting in a weight distribution of about 70 per cent/30 per cent, rear to front, which materially aids driving wheel traction, along with special wide-base "slick" rear tires. Wheelbase generally ranges from 95 to 115 in. A streamlined, single place, aluminum body encloses the frame, engine and driver's compartment with the wheels left "open." The driver is protected by such mandatory safety items as a properly gusseted and braced tubular roll bar, CO_2 fire extinguisher, fuel shut-off valve, ignition kill button, a properly mounted aircraft-type safety belt, a crash helmet and goggles and at least two wheel hydraulic brakes.

Because of the short distances involved, an engine radiator and water pump are considered as non essentials, engine cooling water being circulated by thermo-syphon through transfer tubes built to suit the engine installation. In fact, a few engines are run dry, completely without cooling water.

Still another facet of the hot rod sport are timed straightaway top speed runs. The dry lakes of the Southern California area are no longer suitable for the speeds being turned. Consequently, the week-long annual Bonneville National Speed Trials are held to accommodate these enthusiasts, and attract about 300 entrants from almost every state in the Union. The cars range from slightly modified family sedans to very carefully engineered streamliners, some capable of speeds in excess of 250 mph. Here, body type and engine piston displacement are the classification factors and safety rules are among the most stringent to be found.

In the streamliner classes, the hot rodders have shown their mettle to the rest of the world. In 1953, one car alone broke six International speed records. Another car established a new American and International Diesel record. The record breaking Shadoff Special is perhaps the most advanced streamliner in competition today in this phase of the

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And this fact-filled brochure gives you the whole Flowed-in Gasket Story. Here are a few samples of the things you'll read in this informative new book:

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Using the DAREX Flowed-in Gasket Process, a major manufacturer is saving $50,000 per year in labor and materials on a single gasketing operation. As a result of this striking cost reduction, the firm has recommended the DAREX Process for several more gasketing operations.

ABOUT THE PROCESS

The Flowed-in Gasket Process is a new application of a method of sealing developed by Dewey and Almy researchers over 30 years ago, and successfully used in food container manufacture ever since.

The DAREX Flowed-in Gasket Process is more than a sealing compound . . . more than a machine . . . more than an engineering service . . . *it's a complete Process!* So when you switch to Flowed-in Gaskets, you get all three.

Compounds— Over 800 formulations available to meet most needs. Or Dewey and Almy chemists will develop a "job-tailored" compound for you.

Machines— To apply the compound, Dewey and Almy designs and builds machines based on more than 30 years' field experience.

Service— Every machine is precisely adjusted to your specifications before it leaves the shop. When it arrives, a Dewey and Almy Engineer is on hand to install and adjust the machine. Then he trains your operators to full proficiency. And whenever you need him, the Dewey and Almy Man is at your service.

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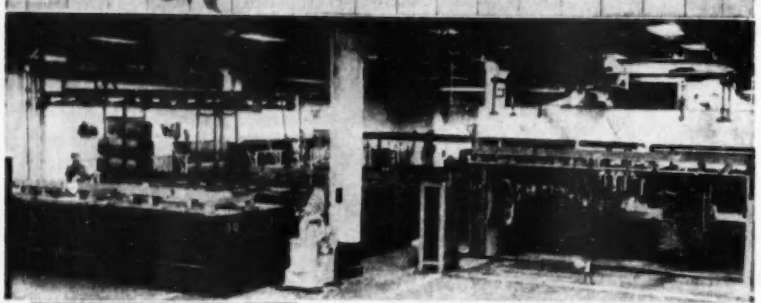

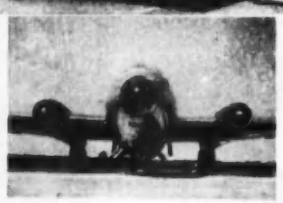

View of a modern "Alodine" No. 1200 installation at the Glenn L. Martin Company plant, Baltimore, Md. In these dip tanks, aluminum components of the USAF B-57 (top) are protectively treated with American Chemical Paint Company's "Alodine" No. 1200.

Alodizing creates a durable bond for paint, and greatly enhances aluminum's natural corrosion resistance, particularly in salt air. Alodizing meets the requirements of Military Specification MIL-C-5541; and was adopted by Martin after a long test period.

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sport. This car was built by Carl Fleischmann in his backyard Glendale, Calif., garage. The chassis frame structure is welded chrome-moly tubing. A tubular axle is used at the front and is suspended by torsion bars parallel to the frame. The rear axle assembly is a full de Dion type made from standard parts with the exception of the short axle shafts, which were machined from 1948 Ford rear axles. Spicer universal joints are used at both inboard and outboard ends of the intermediate axle shafts. Torsion bars are also used at the rear. The Pat Warren two-speed racing type quick-change center section is bolted to a rear crossmember. This unit is shifted hydraulically from the cockpit and allows the conventional transmission and clutch assembly to be dispensed with.

The cockpit is located ahead of the engine so that the engine weight will help to keep the driving wheels on the ground. Cars of this type usually develop a low pressure area above the rear half of the body, which causes the rear wheels to lift clear of the ground at high speeds. Consequently, streamliners are usually built with a weight distribution of about 60/40 per cent, rear to front. The 7.50 x 18 Firestone Bonneville tires are mounted on magneisum pin-drive wheels front and back. Two Ford-Houdaille shock absorbers are mounted at each wheel. Brakes are Goodyear spot-type used at the rear only.

Basic body design was laid out by Dean Batchelor of Burbank, Calif. Models were made up and subjected to searching wind tunnel tests. A final body shape was evolved and the body was constructed of glass fiber reinforced plastic over a male mold. With the present body shape and weight distribution, aerodynamicists claim that speeds in excess of 320 mph would have to be reached before any undesirable "lift" characteristics became noticeable.

The engine that powers the Shadoff car is a modified Chrysler FirePower V-8. Piston displacement has been reduced from 331 cu in. to 303 cu in. so that the car would be eligible for the Bonneville Nationals C Class and for AAA-FIA International C Class. The reduction in displacement was accomplished by inserting cast-iron sleeves in the cylinder bores and boring them to a diameter of 3.7 in. The stroke was shortened to 3.5 in. by reducing the diameter of the crankpins, moving their centers closer to the centerline of the crankshaft. Crankpins were then metal-sprayed and reground to their original diameters. The valve

We've taken the delay out of inclinable press delivery

45 ton

60 ton

75 ton

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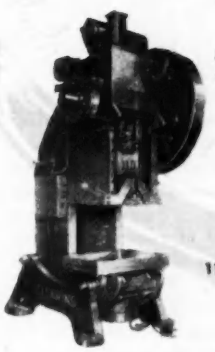
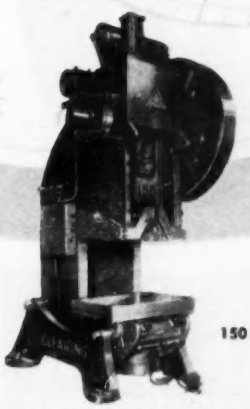
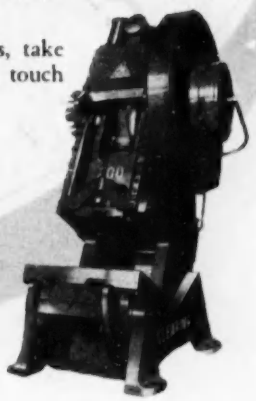


110 ton



150 ton



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train is actuated by a steel camshaft and tubular roller-type followers. Special tubular push rods are used that incorporate adjusting screws at their outer ends for setting valve lash. The standard size FirePower valves have been undercut beneath the valve heads to reduce reciprocating weight. Valve spring pressures have been increased about 50 per cent to reduce the possibility of valve float and spring surge within the normal engine operating range.

Intake ports were ground smooth and polished while the exhaust ports were enlarged slightly with a considerable amount of metal having been removed from the exhaust valve guide bosses. A compression ratio of 12½ to 1 was obtained by using special aluminum alloy, three-ring solid skirt pistons. The piston crowns were machined for valve clearance. A piston-to-wall clearance of 0.012 in., measured at the bottom of the skirt, was used to reduce friction losses at this point.

Fuel is delivered to the engine by a Hilborn constant-flow fuel injection device from a vane-type, engine-driven pump that maintains an operating pressure of 50 psi. A Harman and Collins magneto, originally designed for Ford and Mercury racing conversions, was adapted to this engine.

The crankshaft, connecting rods and rocker arms were X-rayed and Magnafluxed, and the rods and rockers were polished and shot peened. All rotating and reciprocating parts were statically and dynamically balanced. The maximum unbalance does not exceed 1/10 inch-gram.

The engine was prepared for its Bonneville National and AAA-FIA runs on an engine dynamometer. Final power output is reported to be 320 bhp at 5500 rpm using straight methyl alcohol for fuel. Engine speeds of 6400 rpm have been reached at Bonneville without indications of distress in the valve gear.

While this chassis and engine are regarded as the near-ultimate of design and construction in the eyes of the hot rodder, the average amateur competitor, at the drag strip, Bonneville, or both, is still governed by the dollar sign. The cash outlay, as represented by the Shadoff car and others, is entirely too high. Consequently, the average hot rodder must console himself with a chassis and engine of lesser potentialities. Which brings us back to the ever-popular Ford and Mercury L-head V-8's.

These engines, in much modified form, are absolute kings of the drag strips, in spite of their inherent disadvantages. Also, their performance records in top speed trials have, at times, challenged and defeated the best in overhead valve competition. There are several very sound reasons for this. First, the average hot rodder is much more familiar with this type of engine. Second, the tremendous amount of racing equipment specifically designed and produced for Ford and Mercury V-8's makes it possible to build an engine with any number of modifications from 183 to 330 cu in. of piston displacement for a reasonable amount of money. Progress has not stopped on these engines, additional refinements are still being worked out. For example, a builder of a competition Ford or Mercury V-8 can buy a camshaft today that will give a 15 to 20 per cent torque increase all through the rpm range, as compared with camshafts that were produced five years ago. Advances have been made in carburetion as well, and four two-throat carburetors are now practically an essential for successful competition running.

(*Turn to page* 103, *please*)

Engineered by Borg & Beck...
. . . means
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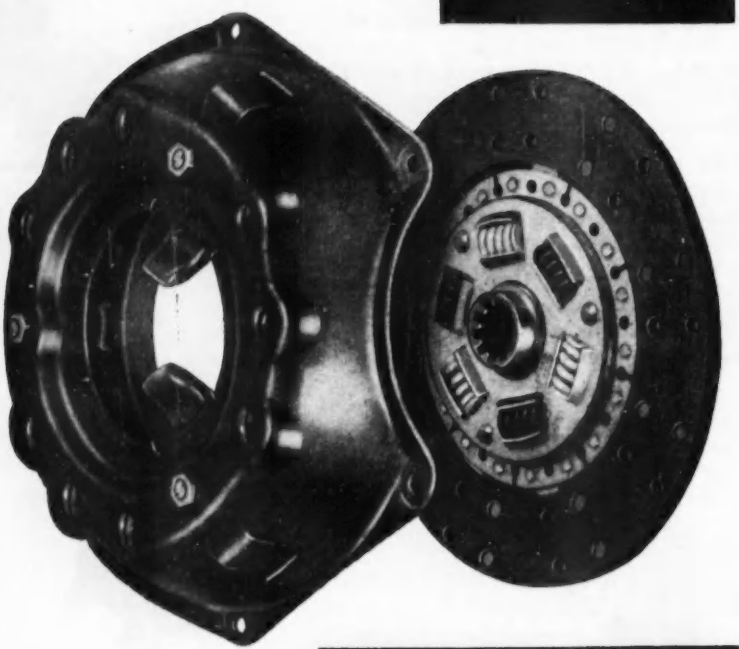

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Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help you cut time and costs in your own work.

FINISHING LARGE AND SMALL DIAMETERS AT THE SAME TIME

Speeder-Operated Boring Bar Does the Trick

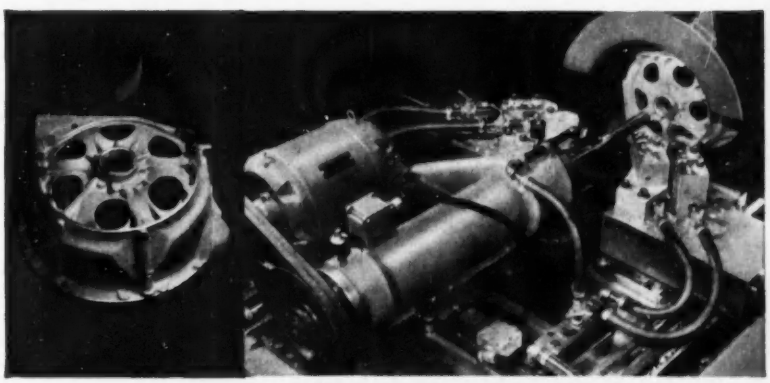
How to achieve both high speed and fine finish on these die-cast aluminum torque converter housings? Here's a nice example of production planning that does it!

This fast, two-operation job is done on a pair of Simplimatic Automatic Lathes. For the first side, the workpiece is clamped on the large flange face by means of an air-operated drawback fixture with location and drive from dowel holes in the flange. Tools mounted on the front and rear slides rough and finish face.

While the front and rear slides are working, tools on a special speeder-equipped, piloted boring bar mounted on the center slide bore and chamfer. Spindle speed is 500 r.p.m., and with the speeder operating, boring speed is increased to 800 r.p.m.—just the right combination of speeds for uniform finish on the machined surfaces. Time for this operation is under 1 minute f.t.f.

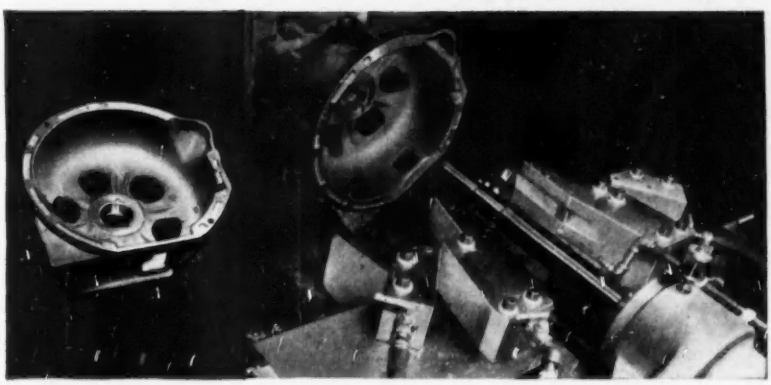
Same Operator Runs 2nd Machine

For the final operation, a special air-operated drawback fixture is also used, locating and driving from dowel holes in the large flange. Part is held against large flange face by clamping through three cored holes. There is a vibration dampener between the fixture and large flange face for quieter operation and prevention of possible chatter.



First Machine with special speeder-operated boring bar.

Second Machine also has special boring bar speeder arrangement.



Once again tools on the front and rear slides rough and finish face while tools on the special, speeder-equipped, piloted boring bar counterbore and chamfer. Again, time is less than 1 minute, f.t.f. One operator can easily handle both machines with hourly production totaling 48 completed housings at 80% efficiency.

Rotating the boring bar as well as the work provides correct speeds for machining all surfaces while saving time and achieving fine finish.

There's a great deal of interesting information in the pages of the Simplimatic catalog; also many helpful job reports. Write for your copy.

GISHOLT

TIME-SAVING IDEAS

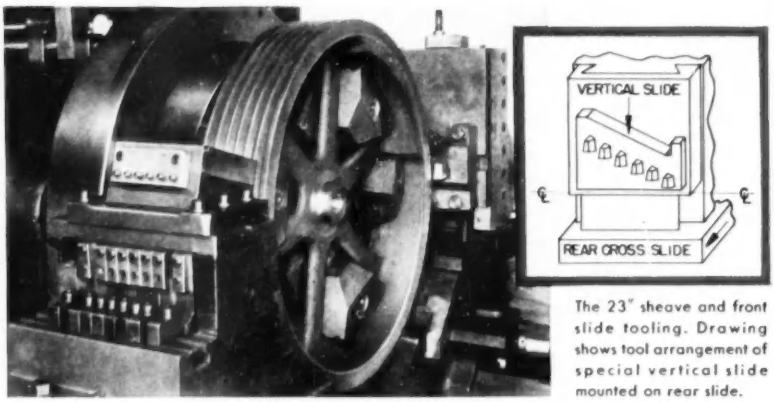
GOOD TIPS ON MACHINING SHEAVES

Novel Tooling on Fastermatic *Automatic* Turret Lathe

Everybody's looking for new ways to get speed and quality at lower cost! Aren't you? Here's a fine example of how you can do it in machining large sheaves.

The 23" diameter parts are handled on a Fastermatic Automatic Turret Lathe. All work on the hub is performed with standard tools on the hexagon turret—drilling, boring, reaming, facing and turning. Tools on a special back-facing attachment, operated through the spindle, face and turn the opposite end.

Of special interest is the unique method of machining the six grooves. First, tools on a special tool block mounted on the front slide rough out the grooves and chamfer the edges. Then, via a smart skiving operation, the grooves are finish-formed. This is done by six tools carried in a special vertical slide mounted on the rear slide. After the rear slide feeds in to a dead stop and holds up, the vertical slide feeds downward. Each tool is mounted slightly higher than the tool preceding it. One tool at a time cuts its groove as it feeds past the center line—assuring fine, smooth finishes with no distortion trouble.



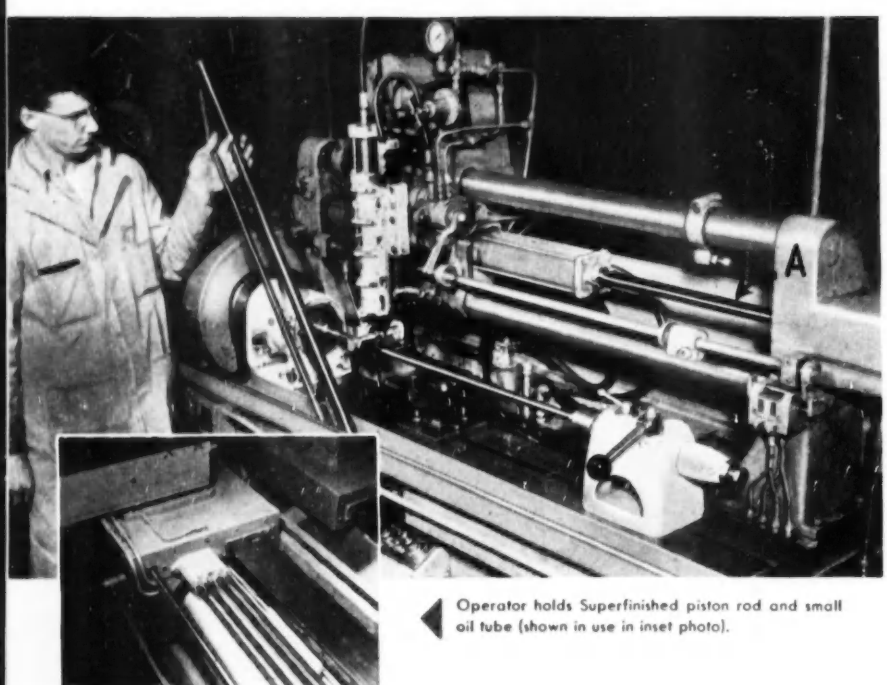
The 23" sheave and front slide tooling. Drawing shows tool arrangement of special vertical slide mounted on rear slide.

This novel single-tool method of finish-forming the grooves eliminates distortion to assure better finish. Automatic production cuts costs.

* * *

PUTTING AN END TO OIL SEAL PROBLEMS

Low-Cost Superfinish Means Better Operation—Less Maintenance



Operator holds Superfinished piston rod and small oil tube (shown in use in inset photo).

In more and more cases, Superfinishing is becoming a part of original specifications. Here it was specified to prevent oil seal troubles and provide more satisfactory and lasting service.

The smaller tube held by the operator is a telescoping connection carrying high-pressure oil to carriages and slides on Gisholt No. 24 Hydraulic Automatic Lathes. For a positive oil seal, the full length is Superfinished to 2½ to 3½ micro-inches from a ground surface of 20 to 30 micro-inches. The same is true of the large rod which is a hydraulic cylinder piston rod similar to "A" on this Superfinishing machine.

Superfinish removes all smear metal left from previous grinding operations. It also eliminates chatter marks and grinding flats which normally cause excessive packing wear and frequent servicing.

Low micro-inch surface readings are quickly obtained at little cost with this Superfinisher which does the job in a fast, automatic cycle.

...WITH MODERN MACHINE TOOLS

GISHOLT

TIME-SAVING IDEAS

THEY WASTE NO TIME HERE...IN PRODUCTION OR CHANGEOVER

117 Parts per Hour with No. 12 Hydraulic Automatic Lathe

A simple enough machining job, this one. But it shows what can be gained by careful start-to-finish planning.

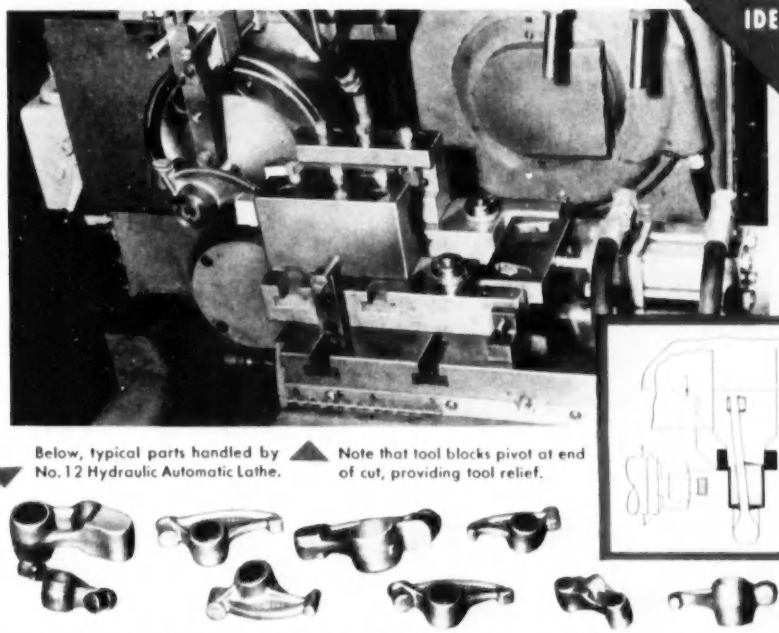
The problem is twofold—speedy straddle facing for these parts, and at the same time—fast, easy changeover for 13 different sizes.

The machine is a Gisholt No. 12 Hydraulic Automatic Lathe—a machine you can't beat for work of this kind. In this case, all work is done from the rear slide, leaving the front of the machine clear for extra-fast loading and unloading.

The workpiece is slipped on an air-operated expanding mandrel, locating from the face of the rocker web against an adjustable jack at the base of the air-operated retractable locator.

To start the cycle, the operator raises a single lever which chucks the part on the mandrel and retracts the locator which in turn actuates a limit switch starting the machine. The rear independent slide feeds forward with tools straddle-facing both hubs. There is tool relief at the end of the cut. Fast starts and stops are provided by the electric clutch and brake. Production is at a rate of 117 parts hourly at 80% efficiency.

As for swift, simple changeover, here's all there is to it: an easy sideward adjustment of tool blocks is made in T-slotted bases; the locator jack is altered and the mandrel is changed for size.



Below, typical parts handled by No. 12 Hydraulic Automatic Lathe.

Note that tool blocks pivot at end of cut, providing tool relief.

Nearly 2 parts a minute are produced here because of fast loading, starting and machining provided by the No. 12 Automatic Lathe.

Twenty-eight interesting examples of quality production of both simple and complex parts are pictured in the complete new No. 12 catalog. Write for it.

★ ★ ★

CAN THIS KIND OF BALANCING HELP YOU?

Workpiece is handled in overhanging position

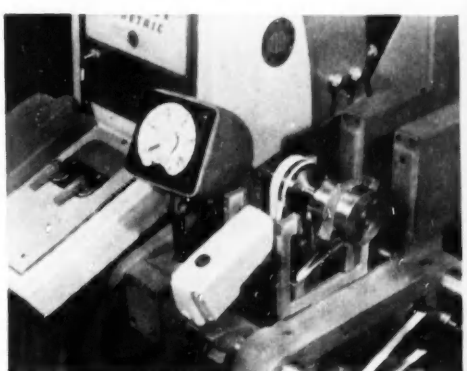
High-speed shaper heads used in woodworking must be accurately balanced. This eliminates vibration during operation, preventing "ripple" or "chatter" marks from marring molding surfaces.

This manufacturer of woodworking equipment solved his problem by dynamically balancing all shaper heads. To simplify and speed up the balancing operation, the Gisholt Improved Type S Balancer is used. With this machine, the workpiece can be balanced in an *overhanging* position—to make loading easier and faster. Correction is made by drilling radially to the indicated depth in the left and right correction planes.

Production balancing to fine tolerances is "everyday work" for Gisholt Balancers. Both large and extremely small amounts of unbalance can be accurately measured and located because amplification is infinitely variable. Bearing movements as little as .000025" are accurately indicated on the standard machine.

Two-plane balancing of these high-speed parts is made faster, easier by use of overhanging arbor.

DYNETRIC BALANCERS GISHOLT



MODERN PRODUCTION BALANCING is one of many important subjects taught in the Gisholt Balancing School. Write for details.

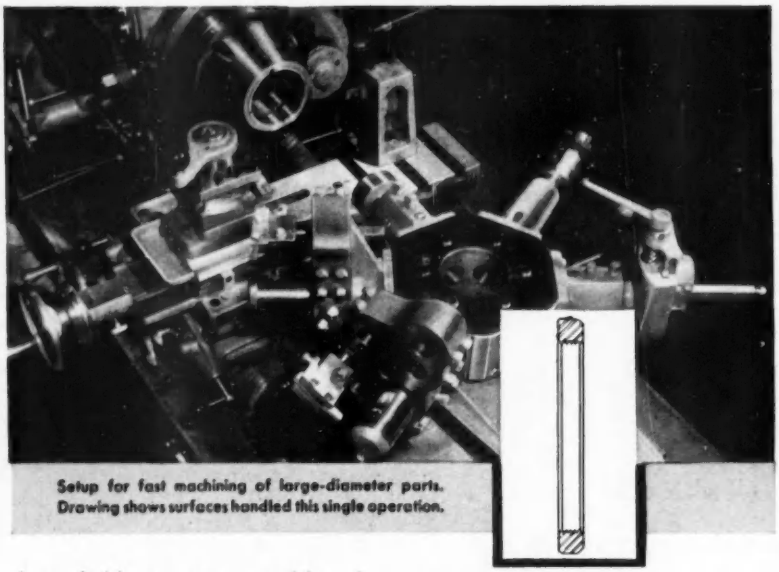
TALK TO GISHOLT ABOUT MACHINE TOOL LEASING

GISHOLT

TIME-SAVING IDEAS

RAM TYPE TURRET LATHE DOES KING-SIZE WORK

Gisholt No. 5 Has Extra-Large Spindle Bore for Light Bar Stock, Tubing, Plastics



Setup for fast machining of large-diameter parts. Drawing shows surfaces handled this single operation.

It isn't often that ram type jobs call for a 4½" spindle bore. When sizes do get in this neighborhood, you may be able to cut costs even before the job is started. How? By proper selection of the machine.

This job illustrates the point. The large fuse liner nuts (and similar parts) are made from 4½" diameter seamless steel tubing. A Gisholt No. 5 Ram Type Turret Lathe was selected because it was available as a standard machine with a 4½" capacity spindle bore.

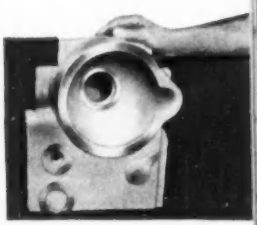
Machining the fuse liner nuts consists of facing, rough and finish boring and turning, chamfering, threading the I. D. and cutting off. Floor to floor time is 2.3 minutes.

The customer is really taking advantage of the faster, easier operation of this ram type machine. It has a hydraulic collet chuck and bar feed and a turret threading attachment. Even so, the cost is considerably below that of the larger type machine which usually handles this size work.

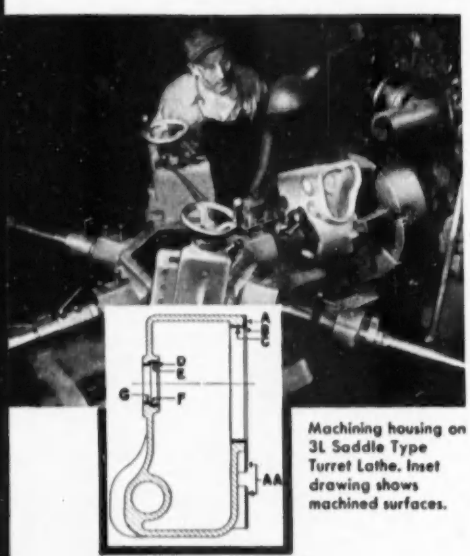
The first and most important step in cost saving here was in selecting the right machine for the job...the standard No. 5 Ram Type Turret Lathe with 4½" spindle bore. From then on low costs were easy.

★ ★ ★

REPETITIVE ACCURACY MADE CERTAIN THIS WAY



Dial Indicator on Saddle Type Turret Lathe Gives Visual Check



Machining housing on 3L Saddle Type Turret Lathe. Inset drawing shows machined surfaces.

What's the best way to maintain close tolerances in machining these awkward cast iron housings? This struck us as a pretty good answer.

Using a Gisholt 3L Saddle Type Turret Lathe, the large irregular-shaped workpiece is held in a 4-jaw independent chuck. Three diameters —*C*, *E* and *G*—are step bored and *D* is chamfered by tools mounted on piloted boring bars. The distance between face *A* and the base of cobore *F* is closely maintained, and a visual check of machine accuracy is provided by the dial indicator mounted on the finish boring bar. Line boring assures concentricity and permits holding close tolerances, part after part.

While boring takes place, tools on the square turret are used to face the front plate surface *A*, three bosses, *AA*, and chamfer *B*. Simultaneous use of tools on the hexagon turret and square turret shows there's time being saved . . . an easy matter with the full-swing side carriage and cross-slide features of the Gisholt Saddle Type Lathe.

Good chucking, good tooling with special attention to accuracy aided by a dial indicator assures a good rate of production with uniformity.

No. 7-854

627

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

1o

High full-flow rates within practical design dimensions: Purolator's famous "accordion-pleated" Micronic* filter element has up to ten times more filtering area than old-style filters—gives high flow rates in a minimum of space.

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Inch for inch and pound for pound, Purolator filters can't be beat. Test after test conducted by leading internal combustion equipment manufacturers prove that Purolator filters give finer, more dependable filtration at optimum flow rates, in minimum space.

Purolators are available in hundreds of different types, for all filter applications, including air, gasoline, lube oil, fuel oil, hydraulic fluids and water. Purolator's engineering staff and research laboratories, *the world's largest*, will be glad to assist you with any filter problem you may have.

Get the latest technical information on Purolator filters. Simply mail in the coupon below.

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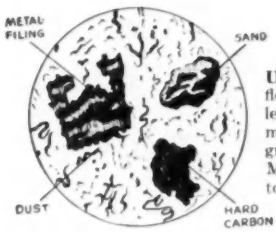
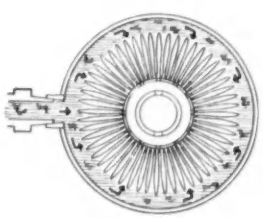


Ultra-micronic filtration: High flow rates are, of course, meaningless unless effective filtration is maintained, too. Electron micrographs prove that the Purolator Micronic filter stops particles down to *submicrons*—.0000039 in.!

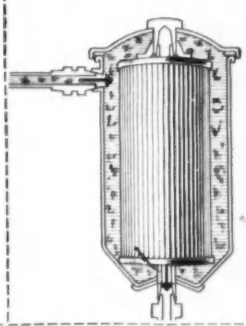
3o

Maximum dirt storage capacity: The pleated design of the Purolator Micronic filter element provides many times more dirt storage space than old-style filters. This important advantage means uniform, efficient performance throughout a long service life.

4o



Minimum pressure drop: With its larger filtering area, the Purolator Micronic filter element introduces a remarkably small pressure drop into the lubricating system . . . permitting pumps of practical size and simple type.



5o

Will not remove or absorb additives: With Purolator Micronic filtration, you keep *all* the oil quality you pay for. The Micronic filter element will not strip additives . . . an important advantage with HD and heat-resistant oils.

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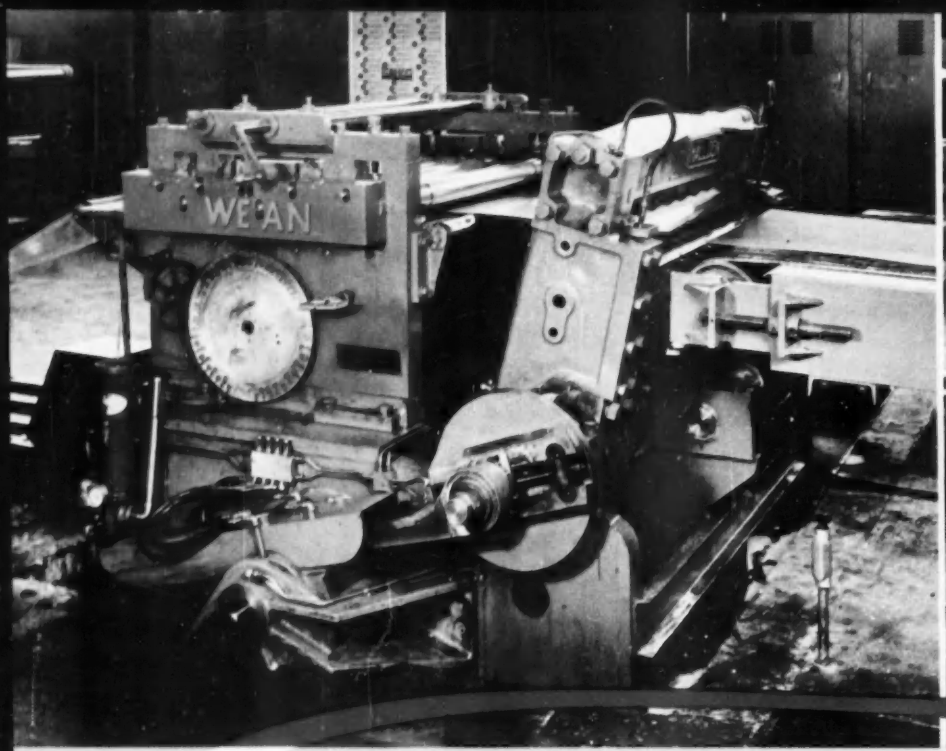
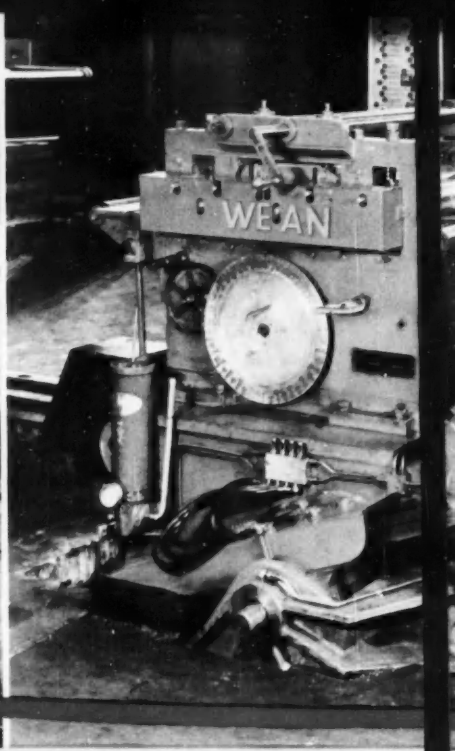
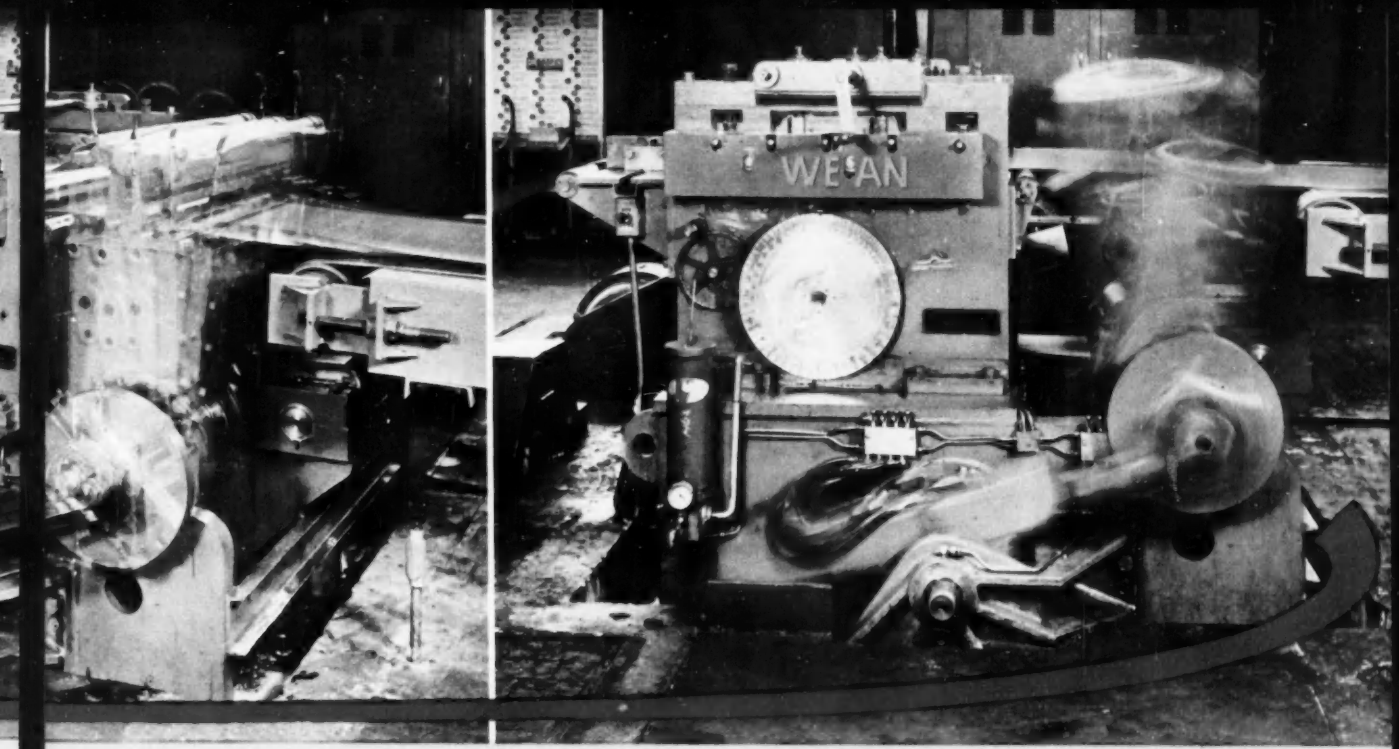




Here's the Amazing Wean That Makes 100 Cuts Per Minute

Saves Bulk Steel Users $20 a Ton

Wean salesmen have a quick and painless method for actually showing you, using your own figures, how, by purchasing steel in coil form, you can save in the neighborhood of $20 per ton on your steel costs. This is an offer you can't afford to overlook. If your plant is situated in an area where a Wean Line is operating we invite you to see it in operation ... talk with the people who operate it ... and we're sure you'll want this great system in your own plant.



Flying Shear Line to Resquared Tolerance

One-hundred cuts per minute to resquared tolerances . . . that's what users of the amazing new Wean Equipment Flying Shear and Slitting System are getting. That's why, if you are using steel in sheet form, it's important to you to get all the facts.

By purchasing steel in coil form you minimize the mill extras — that sometimes amount to more than $1.00 per hundred weight. You reduce considerably both the personnel required to handle and inventory large steel stocks and the space needed to store various cut sizes of steel of the same gauge and analysis.

And this Wean System provides you with faster production. Here is a shear line that will cut to tolerance at the rate of 100 times per minute. Measure this against your present squaring-to-multiples rate and you'll quickly see how a single Wean line can keep a bank of high speed presses in constant operation.

SEE IT IN ACTION . . . YOU'LL AGREE

There's no comparison! The Wean Combination Slitting and Shearing Line is absolutely the last word in speed, precision and automatic operation. Before you buy let a Wean Equipment man show you one of these lines in operation. Talk with the operators. You'll be convinced. Simply contact the Wean office nearest you. They're listed below.

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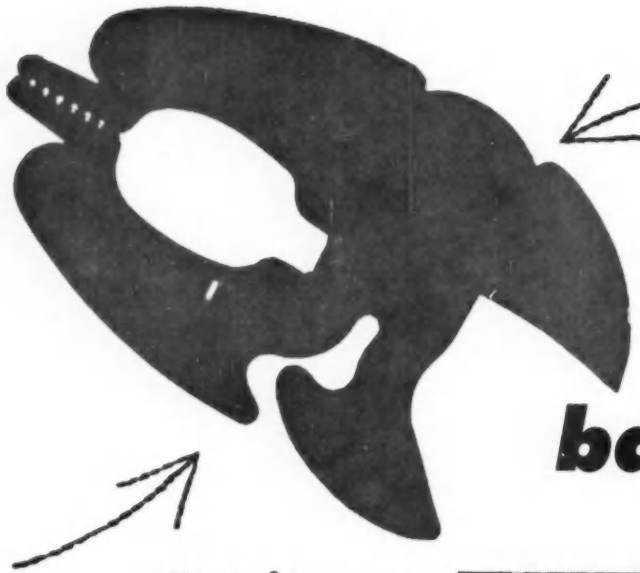
Wean

COMBINATION SLITTING and SHEARING SYSTEMS



Looks like something out of a *bad dream!*

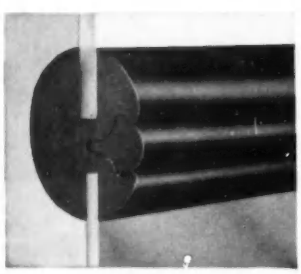
But it sure prevents leaking windshields and fixed windows!

It's a cross-section, greatly enlarged, of a piece of Inland Self-Sealing Weather Strip. All those odd curves, flat surfaces, corners and angles are designed and made *just that way* to give *permanent* leak-proofing on a *particular* windshield or fixed window.

Originated by Inland, it's the *only* weather-seal of its kind. Resilient rubber, permanently compressed, using no cement or binder. See how below.

Best for the vehicle *manufacturer* . . . less material and fast, one-man, low-cost installation. *Best* for the *user* . . . safer driving, no service, lower cost when replacing broken glass in vehicles.

INLAND MANUFACTURING DIVISION
General Motors Corporation • Dayton, Ohio

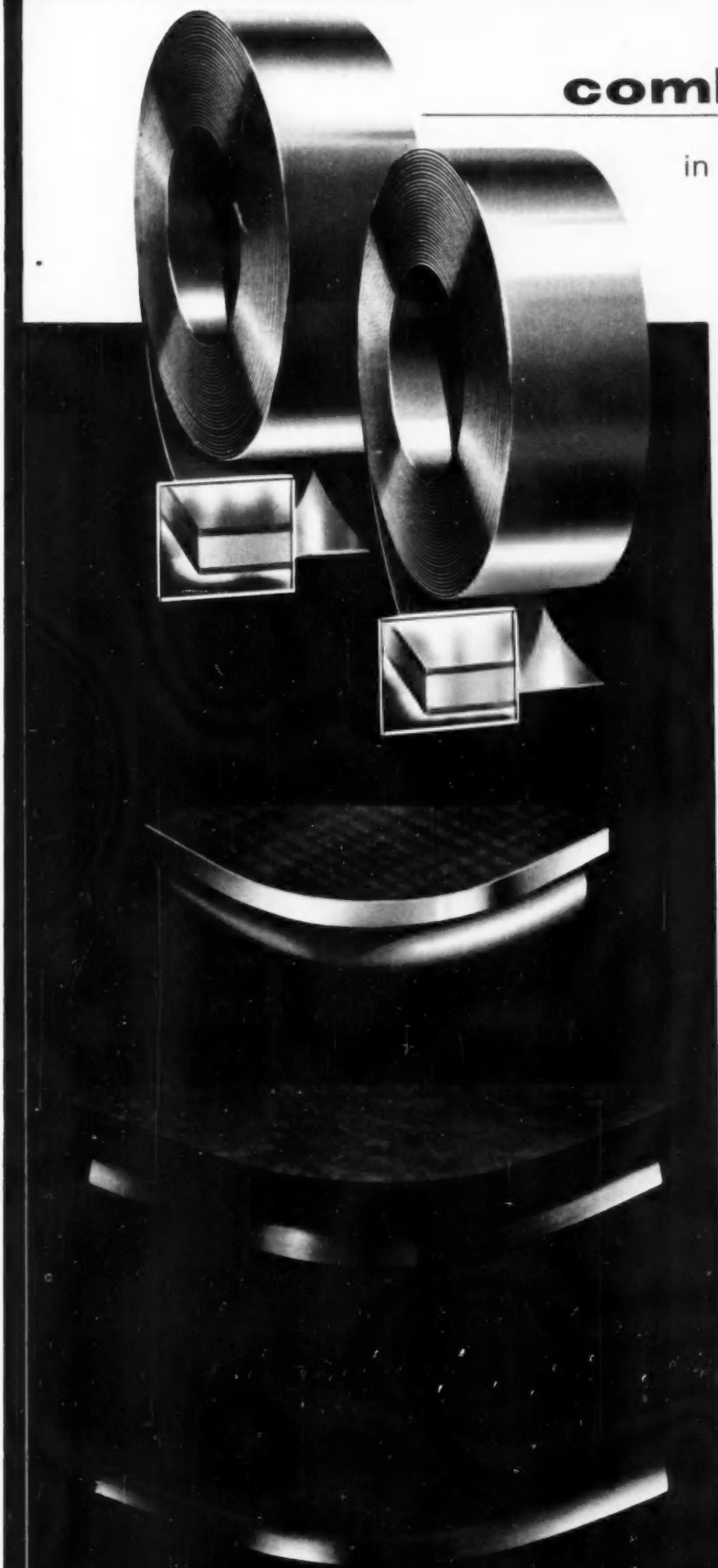


Here's how it works!

One of the simplest forms of Inland Self-Sealing Weather Strip is shown here. The Strip goes into the body panel or other opening. Then the glass goes into the Strip. Then the over-size filler strip goes into the locking channel, expanding it, compressing the whole Inland Self-Sealing Weather Strip into a complete and permanent leak-proof seal!

INLAND MANUFACTURING

Self-Sealing WEATHER STRIP



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— economy

— strength

— practicality

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MOULDINGS of SuVeneer Copper or Brass Clad Metal exemplify *beauty and utility* in every application . . . mirror-bright, or satin-finished for rich color, as in the table-top sections pictured here. ● You benefit by lower cost, higher strength, standard ease of fabrication. *Write!*

Ask for your copy of our widely-read publication, "An Introduction to Clad Metals," free on request.

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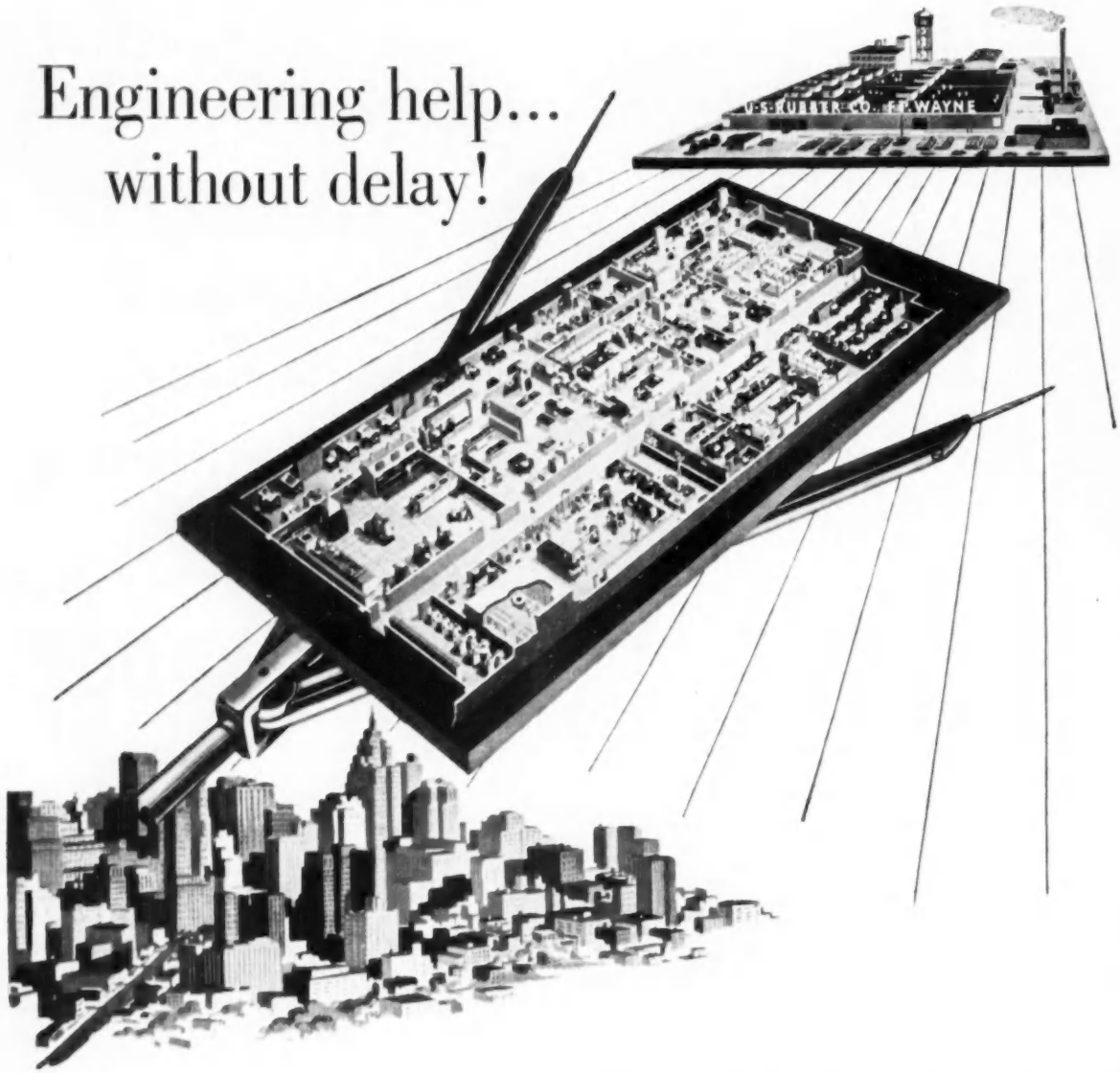
Engineering help... without delay!



If you have a problem in production or design, you need only phone United States Rubber Company sales engineers—in the New Center Bldg., Detroit—Trinity 4-3500. They can quickly put at your disposal the services of the great "U.S." plant and laboratory at Fort Wayne. In this up-to-the-minute installation, scientists and engineers are at work developing new ways to make your product work more efficiently. Precision molded rubber and plastic parts, rubber-to-metal parts and precision extrusions—these are but a few of the items which—in a multitude of specifications—"U.S." experts turn out every day. Don't consider any problem too tough before you've consulted "U.S." Phone Trinity 4-3500, ask for Mechanical Goods Division, or write the address below.

"U.S." Research perfects it
"U.S." Production builds it

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Battle Creek, Michigan

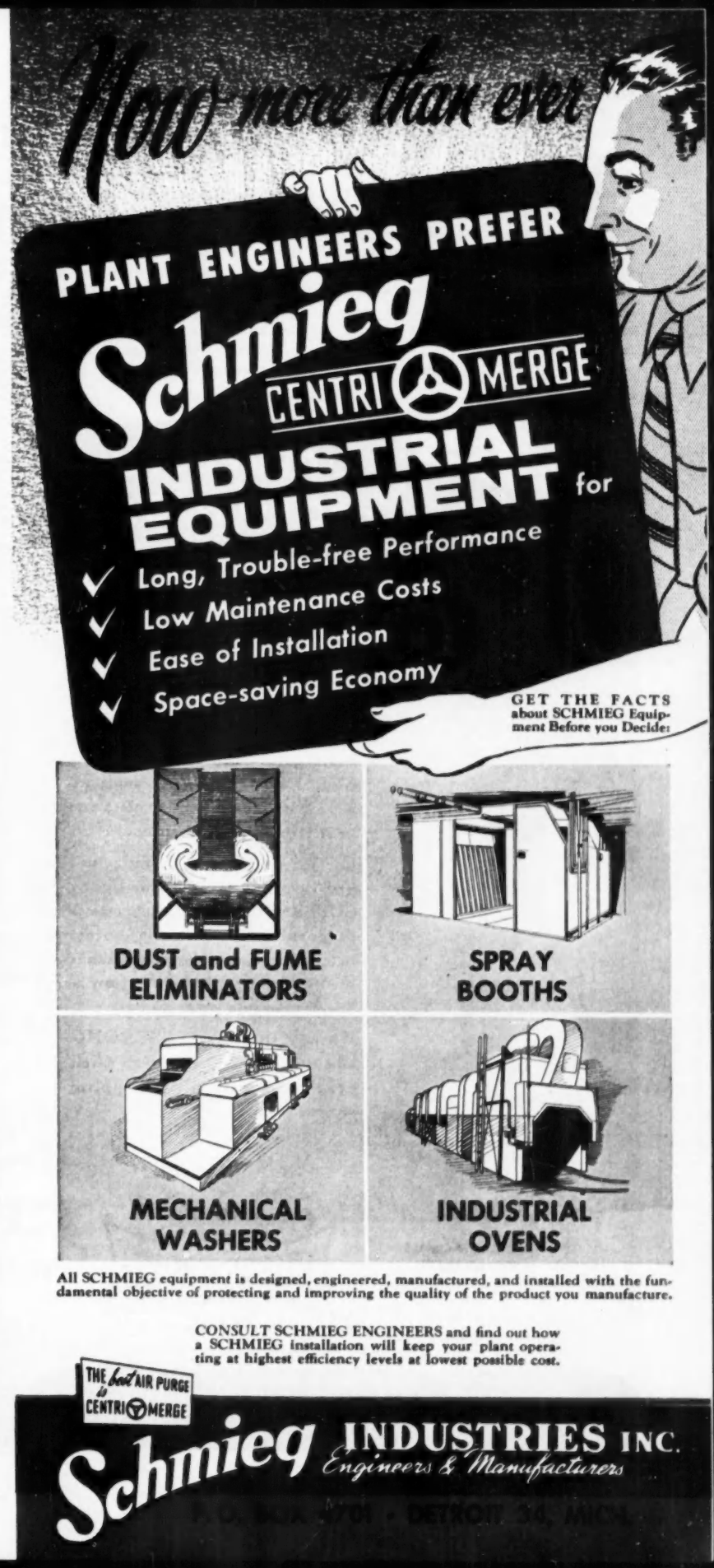
Hot Rod Trends

(*Continued from page* 90)

The most important factor for the continued popularity of these engines in competition lies in their ability to transform large percentages of fuel additives into additional **torque.** Methyl alcohol is regarded as the basic competition fuel. Of the additives that are miscible with methyl alcohol, nitromethane, or "nitro" as it is called, is by far the most popular and the most beneficial from the standpoint of power output. As yet, the hot rodders haven't discovered the proper method of using large percentages of nitromethane with overhead valve engines that are equipped with cast iron cylinder heads. Primarily, this is a problem of combustion chamber temperature and heat transfer. The heat conducting qualities of cast iron, as compared to aluminum, make it quite difficult to use a large dose of nitromethane without a very destructive form of detonation and/or pre-ignition. It's almost unheard of for such an engine to successfully use more than an 80-20 per cent mixture of methyl alcohol to nitromethane.

On the other hand, properly prepared Ford or Mercury V-8 engines have used as high as 40 per cent nitromethane for sustained top speed runs and 60 to 75 per cent on quarter-mile drag strips. To cite an example, one 295 cu in. Mercury engine (3⅜ in. bore by 4⅛ in. stroke) produced 240 bhp at 5000 rpm using methyl alcohol. The same engine was tested again with 40 per cent nitromethane after corrections had been made to the carburetion. Its output jumped to 300 bhp at 5000 rpm, which represents a net power increase of 25 per cent.

There are several important steps that must not be overlooked when a good nitro burner is being built. First and foremost, the fuel flow rate with 40 per cent nitromethane is roughly twice that of straight methyl alcohol. This necessitates the use of special carburetor needle valves and seats, special main metering jets and power jets. The intake and exhaust ports in the cylinder block must be enlarged and polished. The block must be "relieved" between the valves and cylinder bores to provide an adequate transfer passage. Sharp edges within the combustion chamber must be chamfered or radiused; the cylinder head gasket must not overhand into the combustion chamber; the threads of either spark plug or spark plug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hole must not be exposed; valves must be "flush seated" with the surfaces of the block, polished and sharp edges removed. All of these things must be done to reduce the likelihood of detonation or pre-ignition because mixtures of nitromethane are highly sensitive to pressure and temperature increases. However, excessive amounts of metal cannot be removed from the combustion chamber surfaces in light of the fact that a compression ratio of from 10 to 11 to 1 must be used for best results.

The use of 1¾ in. diameter valves for intake ports, after the valve seat inserts have been removed, has been carried over to the exhaust ports as well. This was not due to the need of a larger exhaust valve. In most cases the standard 1½ inch valve will function satisfactorily with either gasoline or methyl alcohol for fuel. It's a different story with nitromethane. During a very long and exhaustive series of dynamometer tests involving large percentages of nitromethane, many false clues were chased to determine the cause of detonation, then pre-ignition, during prolonged full throttle, full load runs. Finally, and quite by accident, the periphery of an exhaust valve seat insert was found to be blue from excessive heat. The remaining valve seat inserts were removed, valve pockets were ground out to match the seat insert counterbore and 1¾ in. exhaust valves were seated directly on the block, eliminating detonation and pre-ignition.

Examples of such thorough and painstaking work are witnessed almost daily within the hot rod ranks. Although only a small percentage of hot rodders ever become highly skilled automotive professionals, they do develop into inventive and practical-minded young people who deserve observance by the manufacturers of the nation's automotive equipment.

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Automatic Ultrasonic Inspection

(*Continued from page* 49)

holes punched in a tape. By an arrangement which provides 12 holes for each function of the scanning machine, each servo-motor must seek one out of a possible 4096 positions in which to come to a rest. In all, 60 holes are punched in the tape for each scan line. Then the servo-motors and control automatically go into action to "program" horizontal, vertical, and angular positions of the scanning head, turntable speed for rotating the specimen, ultrasonic power level, and four other control functions necessary to operation of the machine. Any number of required scan lines can be programmed by punching hole-lines on the tape. First use of the machine will require 15 minutes to test each piece, but, if required, two hours continuous and automatic control of the machine could be programmed by the tape.

A recorder makes a continuous plan view of the results of the ultrasonic test while the scanning procedure advances. The resulting permanent record shows all ultrasonic echo signals amplified from the search unit. The chart is used to interpret a test while in process and can be filed for reference.

An operator can control the machine manually or start automatic testing. Also, all ultrasonic echo signals are visually displayed on the face of a cathode-ray tube to provide the operator with visual monitoring of data recorded on the chart record. The console incorporates a Sperry Reflectoscope as a basic part of the complete system.

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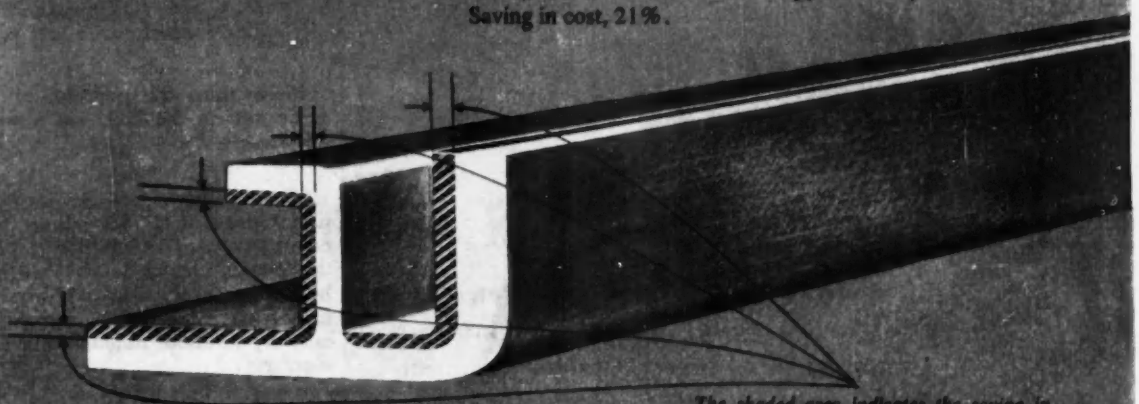

The shaded area indicates the saving in material made possible by using 66S.

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•

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•

Approximately two out of three speedometers deviate from the truth about the actual speed of a car.

•

Trucks hauled approximately 8½ billion tons of cargo last year.

•

More than 22 percent of all radio sets in the U.S. are now in automobiles.

•

Interest payments on the national debt of $274.5 billion will cost taxpayers $6.5 billion during the current fiscal year. The $6.5 billion is the third largest item in the Federal budget, exceeded only by national defense and foreign aid.

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A present-day jet fighter has enough power to pull a 360-car freight train.

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For the first time in history, the capacity of U.S. refineries exceeds eight million barrels a day, and is expected to exceed even this impressive record by Sept.

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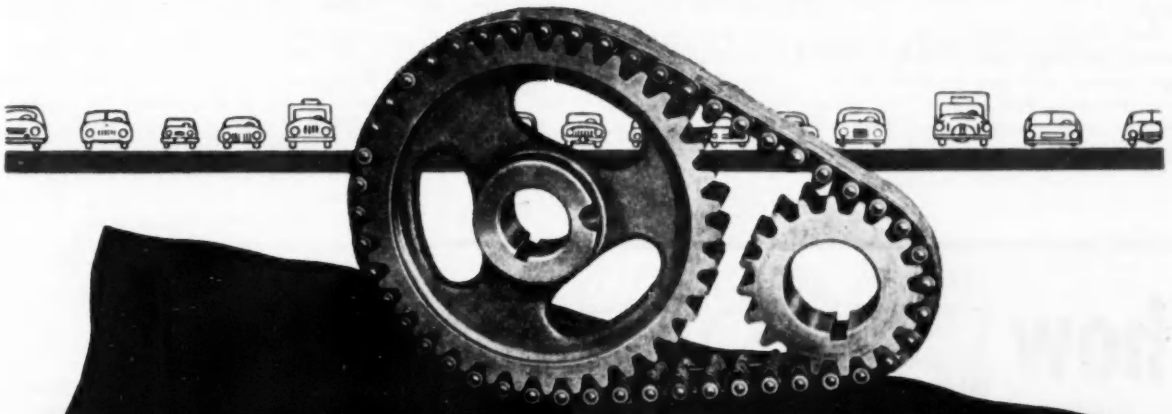

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Prospects for Small Industrial Gas Turbines

(*Continued from page* 48)

selling at a profit, smaller quantities before large volume can be considered.

One of our welded type turbine wheels, starting with the as-cast blade and ending with the balanced rotor assembly requires a total of 144 steps and 84 separate operations, and no less than 22 inspections of various exacting types. A study of available data showed handling time to be 84 per cent of the total flow time, as compared to actual machine time of only 3½ per cent.

Even with the excess handling time eliminated, two other major steps are necessary to achieve a low cost turbine wheel, namely, reduction of the number of operations, and reduction of the chances of rejection of the finished or semi-finished wheel in the inspection operations.

We are quite optimistic that relatively rapid progress can be made in both of these directions. Automatic welding, for example, can reduce the total welding time for the turbine wheel from 5.70 hours to around 48 minutes. At the same time, automatic welding promises better consistency with no sacrifice in weld quality. Elimination of blade base grinding to obtain close weld "fit up" of the assembled blades, is another good possibility for time saving. This would cut out 17 operations.

Another step we foresee is elimination of the weld operation to attach the shaft to the wheel hub. One method is to shrink the shaft on a stub extension of the wheel disk, an expedient that has proved quite successful on the second-stage wheel of the Boeing turbine. Another method with even greater potential saving in cost, is use of an integral forged wheel hub and shaft of non-critical alloy. In this case, a cast, or welded blade ring assembly would be welded directly to the disk hub on the shaft, and the chief problem involved is how far out from the hub center this weld joint can be placed without getting into an area hot enough to jeopardize rim burst strength. The welded joint will be weakest at the junction with the non-high temperature shaft alloy, unless the operating temperature of this area is kept down below the range of 900 to 1000 F.

Eliminating rejections in top quality welding operations, requiring X-ray and Zyglo inspections, is quite a proposition, as those familiar with welding problems will readily agree. Nevertheless, remarkable progress has been made in improving weld quality in turbine wheels, by persistent metallurgical and welding research. We have also accumulated experience history indicating that inspection acceptance limits can be relaxed in a number of respects without reducing wheel life. By thus tackling both ends of the production reject problem, that is, working toward better quality as well as broader acceptance standards, substantial reductions in production cost can be realized. Figure 5 is a compilation of all the types of defects that can occur in turbine wheel welds. Such work in segregating and defining types of de-

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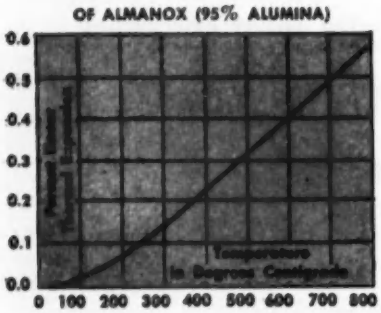

Not only the remarkable heat resistance of Alumina ceramics but their low thermal expansion (like that of ALMANOX shown at left) presents wide design possibilities whether for mechanical, electrical or electronic applications.

For complete information, send for this bulletin on Design Principles and chart of electrical and Mechanical properties of FRENCHTOWN ENGINEERED CERAMICS.

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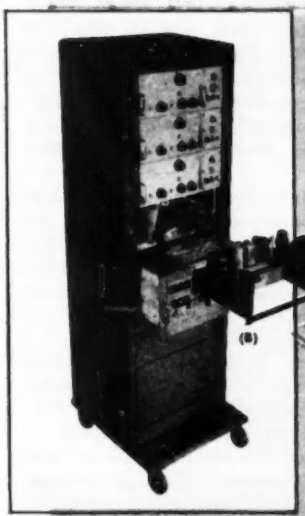

Preamplifier (A) in position to plug into a driver amplifier with frame, combined with power supply and control panel (B) which is normally already in place in the basic cabinet assembly.

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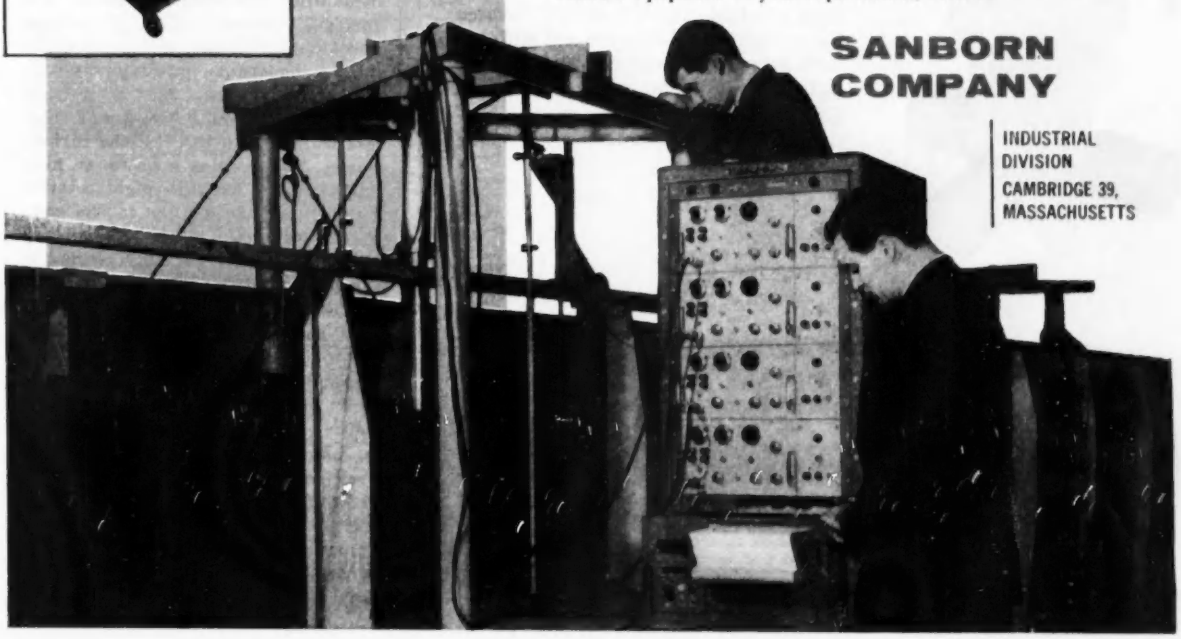

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fects has been invaluable in controlling weld quality.

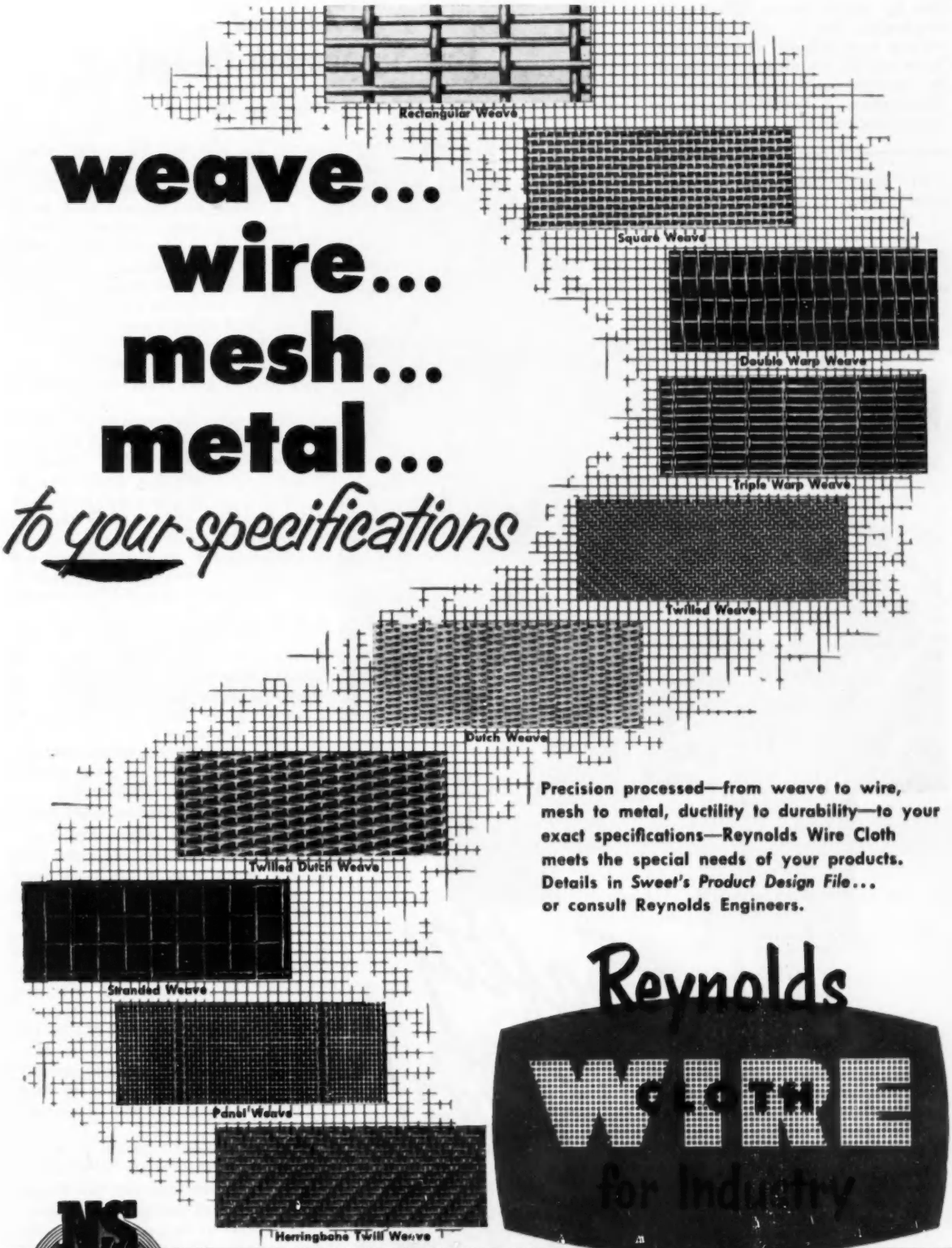
A recent study of 330 production wheels shows that not only can the chronic types of weld defects such as porosity and fusion line shrink cracks, be controlled at low occurrence levels, but also that no engine operating trouble has occurred that can be attributed to these defects. Thus wider inspection limits can be tolerated without risk. As in most modern mechanisms, an understanding of, and provisions for the critical design factors of the turbine wheel as established by testing, has proved to be generally more important than perfection in material quality.

The total number of operations for producing this first-stage turbine wheel can be reduced from 84 to 63, and the shop hours including inspection, cut from 115 to 51. This means a reduction in manufacturing cost from $1000 per wheel, which is approximately the present cost, to about $250. This is for small quantity production without any special purpose machine tools, so that further substantial cost reductions should be possible with volume production.

The high cost of the special alloys is often mentioned as a barrier to low cost turbines. However, material's costs are small compared to the costs of fabrication. In the $1000 turbine wheel under discussion, the cost of the alloys is only about $40.

We foresee, then, low cost turbine wheels with adequate dependability and competitive life in service. This has been one of the big questions in evaluating the small industrial gas turbine. There are reliability and produceability problems with some of the other components, notably the turbine nozzles and the compressor wheels, but the difficulties are of much less stature than those of the turbine wheel. The nozzles operate at high temperatures but the high rotative stresses are absent, and in the compressor wheel the rotational stress is present, but not the high temperatures.

Now, to go back to the three reasons cited for lack of present demand for industrial gas turbines, we have to a degree disposed of two of them, high manufacturing cost and reliability, leaving the third, high fuel consumption, still to be overcome. Fuel consumption is not yet down where it ought to be, but Fig. 6 shows that we are on the way. This kind of a curve can be subject to serious error in the predicted portion because it is based on calculations and judgment, but the 0.700 specific fuel consump-



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tion by 1957 is where we think we are headed. How far down this curve we will have to go to stimulate sales is not known, but we think there will be a good market at 0.700 specific fuel consumption, if the engine price is competitive.

The above article is from a paper presented by the author at the May 17 Meeting of the Central Illinois Section of the Society of Automotive Engineers, held at Peoria, Ill.

An Advanced Bus Suspension Design

(*Continued from page* 40)

would be in the neighborhood of 5 in., which we felt was not acceptable for the more luxurious of the buses in the line under consideration and it would not take advantage of the large improvements possible. However, it was decided to consider eliminating the constant level effect on some of the less luxurious buses, particularly until further comparative data could be accumulated on the road.

Utilizing the constant level device the dynamic rates decided upon were 400 lb per in. for each front wheel and 700 lb per in. for each rear wheel. This gave dynamic deflections, empty of 6.5 in. front and 7.4 in. rear. Similar loaded deflections were 9.2 in. front and 10 in. rear.

The use of somewhat softer rear deflections than front was arrived at during actual road tests. There is much more data available on passenger cars than on buses and there are reasons to believe that somewhat softer suspension in front than in the rear might be advantageous in a passenger car. This same thinking was applied to the bus at first, particularly since the rear overhang and mass of the rear mounted engine have a considerable effect on the over-all polar moment of inertia of the sprung mass and also on the center of rotation for excitations originating in the rear wheels. The elastic rate of the rear shackles is not included in the above figures but is not sufficient to modify appreciably the over-all requirements indicated. On the bus, best results were obtained by using greater nominal deflection in the rear.

Design of the constant level device is shown schematically in Fig. 5.

A production pump and motor unit used normally on a lift truck were used to supply oil at 1500 psi minimum pressure. The storage capacity was enlarged to one gallon. A production type accumulator was picked having a capacity of one pint. Under these circumstances, and with the linkage shown it requires approximately 100 cu in. of fluid to take the bus from completely empty to fully loaded, and with a pump of roughly 0.93 gpm capacity the time lag from empty to loaded bus will be approximately 30 sec.

It was decided it would be uneconomical to provide an accumulator with sufficient capacity to handle maximum load change since passengers could not be loaded or unloaded as fast as the pump displaces fluid and therefore the accumulator is largely a means of preventing pressure drop with slight leakages and reducing the cycling of the pressure sensitive switch which controls the

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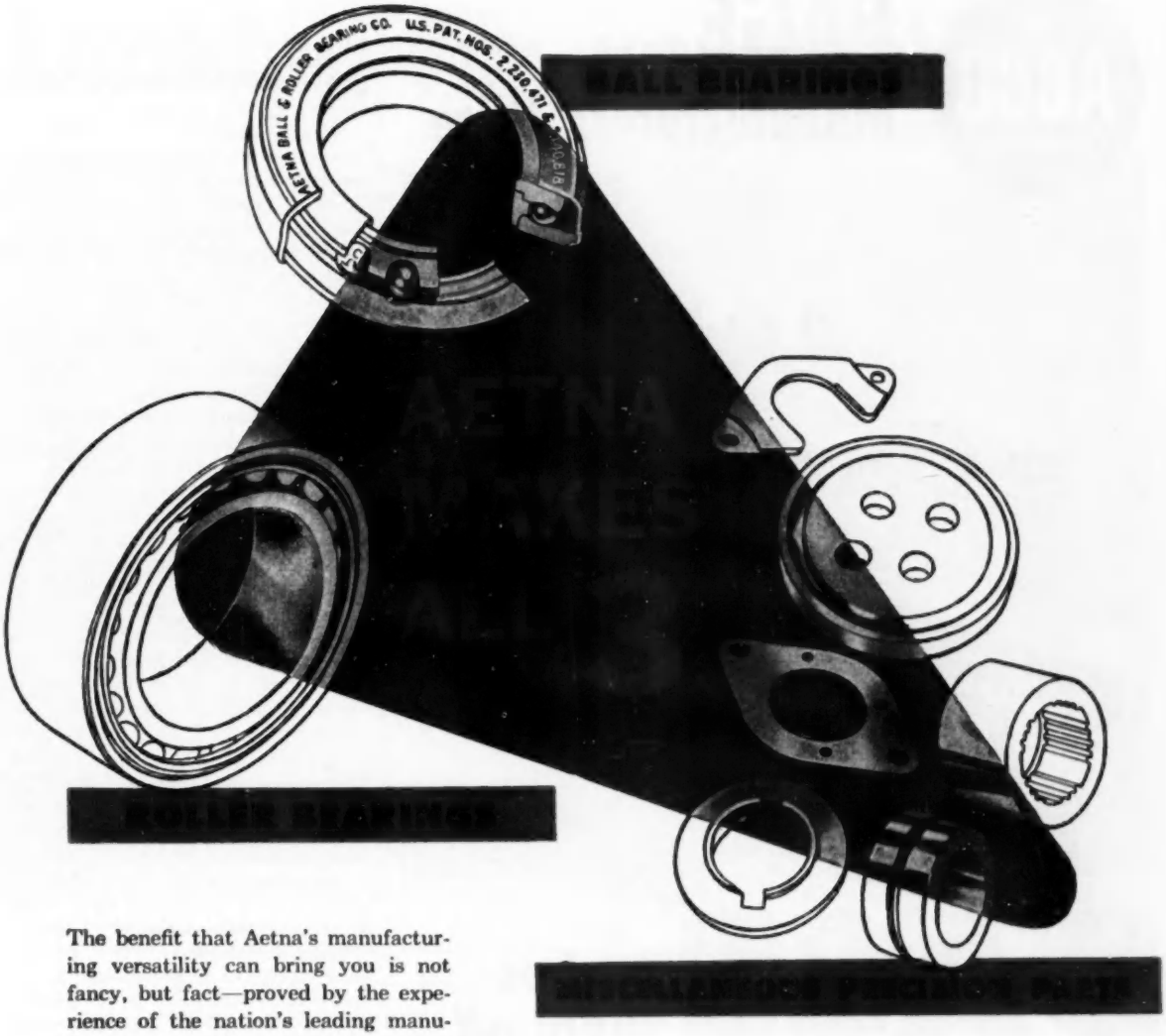

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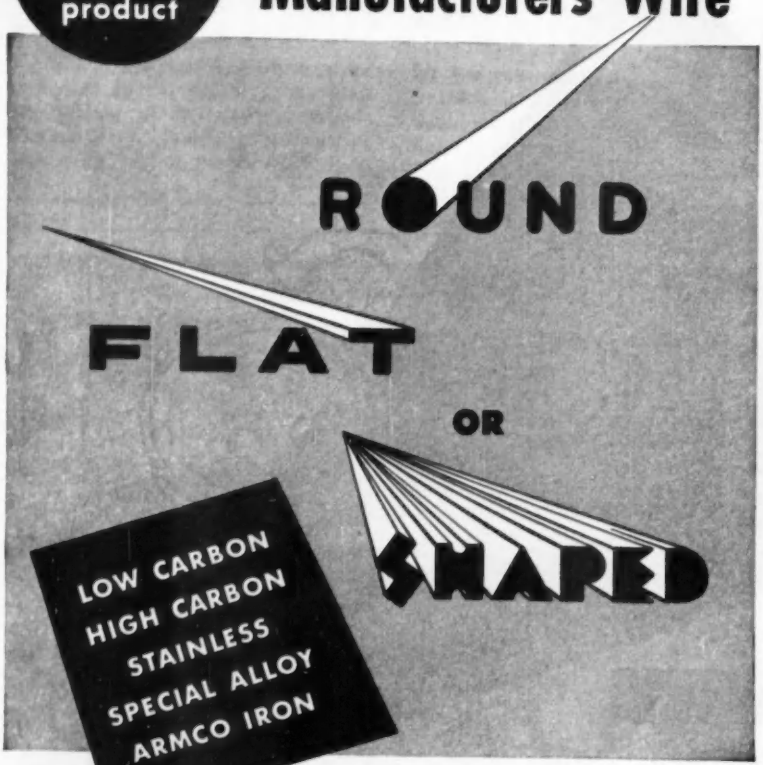

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plus / Welding Electrodes Wires Rods

operation of the pump motor.

While the hydraulic pistons controlling the two front or the two rear wheels are assembled in one central cylinder casting, each wheel operates separately. The position of each wheel spring is controlled, rotationally, by one of the pistons. Oil is valved into or out of that particular cylinder by a valve linked to that wheel. As the load increases the tendency is for the wheel to lift in relation to the chassis and open the high pressure connection to the cylinder. As the load decreases the low pressure valve is opened. To avoid cycling due to action on the road, each valve is damped hydraulically to require a definite time lag before it will change position.

The shock absorber location was quite easily decided in the front. In the rear there were many interferences to contend with. However, the criterion used was to lay chassis roll about the roll center, which for this suspension lies at the height of the spring shackles. The various possible locations for mounting the shock absorbers were then studied with relation to the fluid displaced in roll as compared to that displaced for vertical motion.

The front wheel geometry was laid out to give virtually zero change in track throughout wheel stroke although very little change in camber was necessary, the actual figures being minus 4½ deg for 5 in. wheel lift and zero for 5 in. wheel drop from the middle of the wheel stroke. Change in camber is shown graphically in Fig. 6. A photograph of the front suspension parts is reproduced in Fig. 7 and of the rear suspension parts in Fig. 8.

During road tests it was developed that somewhat tighter tolerances are necessary on wheel and tire out of balance than have been specified in production. Production tolerances have called for 140 in. oz although it was found that this limit had not actually been maintained in production. The new suspension system would operate without serious difficulty with this maximum amount of out of balance, but to avoid any sign of disturbance it was necessary to drop to approximately 75 in. oz per wheel and tire.

The front springs for this design weighed 83 lb each including 21.2 lb of rubber while the rear springs weighed 129 lb including 33 lb of rubber. These weights do not include housings, arms and related parts. It was difficult to obtain an accurate over-all comparison of the difference in weight of the suspension of this

Looking for versatility?

Illustration shows closeups of machine milling 36-gauge rack in textile machine needle beds with a gang of 58 cutters.

This production machine mills racks of varying pitches, widths and lengths

Here is another example of how the Special Machinery Division of Kearney & Trecker helps solve specific production problems. This rack milling machine was designed and produced for a textile machinery manufacturer who required a highly versatile machine that could mill racks up to 14' long with widely varying characteristics. The table has a working surface of 18" x 19', and the entire traveling head and knee assembly is rigidly supported on three hardened and ground steel ways.

Positioning can be accomplished manually or by power. A shot bolt, which engages in bored holes along one side of the indexing fixture, assures final positive positioning.

If you'd like to know how Kearney & Trecker special machinery can give you the exact tool you require, contact your representative or write for the booklet "Doorway to a proven method for solving big or small metal-working problems." For details on this particular machine, ask for Data Sheet No. 1011. Kearney & Trecker Corp., 6784 West National Avenue, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER CORP. · *Special Machinery Division*
MILWAUKEE 14, WIS., U. S. A.

vehicle and one with a more conventional suspension since there was no comparable vehicle for comparison. However, the indications are that there might be some gain, or at least no sacrifice in weight with the improved design.

Actual road tests on this vehicle were highly satisfactory. Noise level, harshness and shake are all at very low level and the bus handles extremely well under all conditions of smooth and rough roads, cornering, and operation throughout the speed range.

Perhaps Transportation Is Russia's Achilles' Heel

BASED on a recent news dispatch from Moscow to the *New York Times*, further investigation disclosed that on May 24, 1954, in *Pravda*, the perennial boss of Russia's heavy industry and transportation, Lazar Kaganovich, a Deputy Premier, quoted and developed Professor Holland Hunter's conclusions* that transportation was, in 1951, no longer a decisive Soviet weakness and source of vulnerability. Kaganovich went on to say: "What is true, is true! Our heel has been tempered harder than that of the ancient Greek Achilles (Laughter, Applause).

"On that heel we marched to Berlin and, if an emulator of Hitler can be found, then, on that heel we would, by means of the power of our glorious Soviet Army, reach even a more distant goal . . . "

Why did Kaganovich quote AUTOMOTIVE INDUSTRIES, a journal certainly not designed to further the Kremlin's ends? The content of his speech, and of an earlier one (*Pravda*, April 27, 1954) help answer this question. Both are devoted to a searching analysis of the *weaknesses* of Soviet transportation.

All in all, Kaganovich's speeches painted a gloomy picture, a picture difficult to reconcile with the broad image of all-conquering Communism. To reassure his listeners, and especially the leaders in transportation, that conditions are not as bad as they seem, particularly for war, Kaganovich seized upon the conclusion—stripped, one must say, of its qualifications—of a disinterested expert in an American technical journal. Apparently, even in the Soviet Union, such an opinion bears more weight than does the official bombast.

—Demitri Shimkin, consulting editor for AUTOMOTIVE INDUSTRIES, on Russian industrial affairs.

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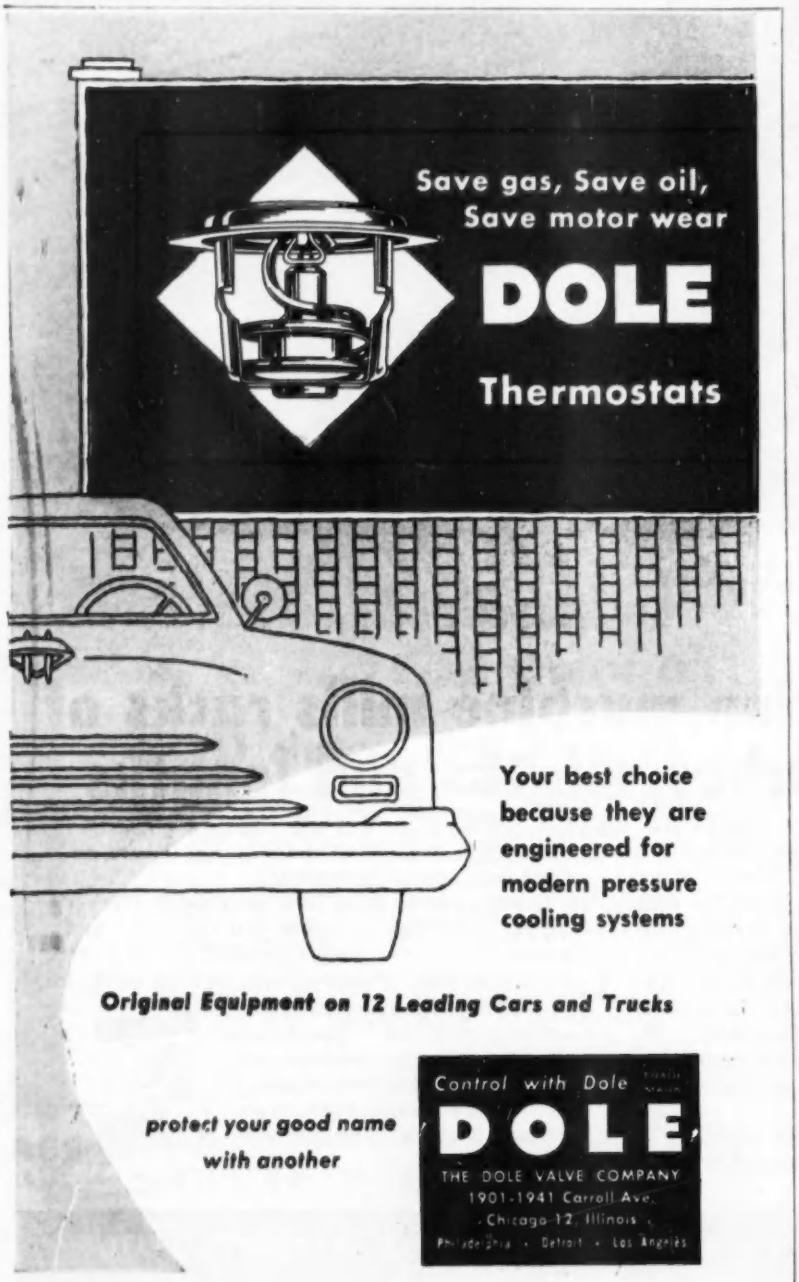
* *Holland Hunter: "Transport—Russia's Achilles' Heel?"* AUTOMOTIVE INDUSTRIES, *Sept.* 15, 1951.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MANUFACTURING

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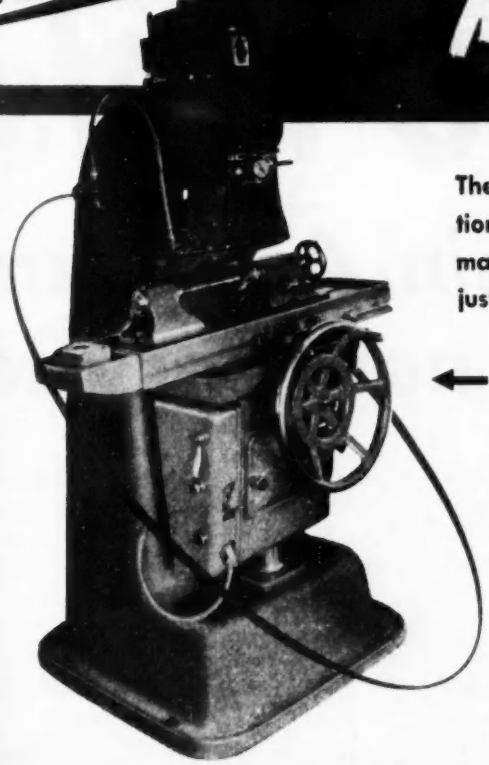
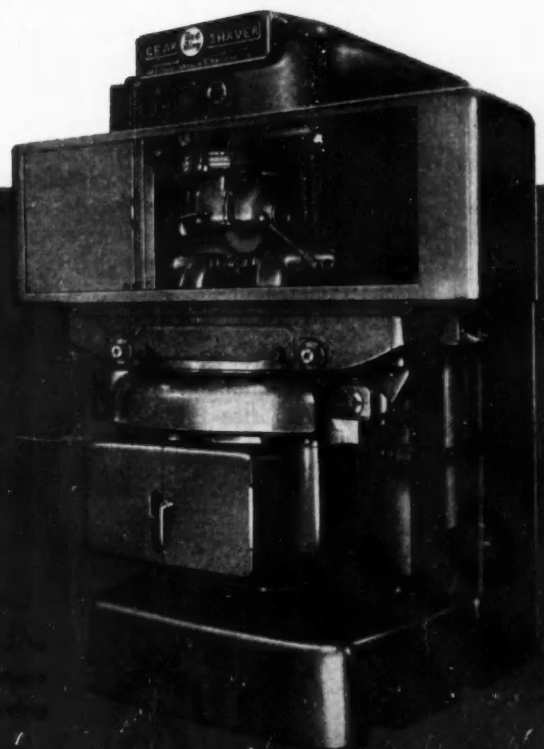


The one sure way of meeting today's competition is with today's machine tools. The older machines were all right in their day but they just haven't got what it takes now.

← **For instance,** it took this old Red Ring Model GCC 60 seconds to shave a gear like the one shown. →



Model GCU today finishes that same gear in just 16 seconds—and to much closer tolerances, too.

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top men in American about a new service

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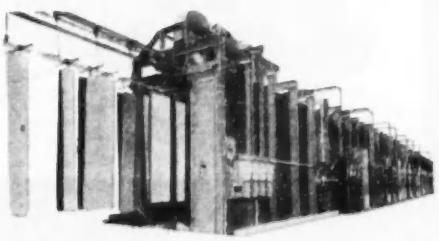

Vitreous Enameling Furnace field-erected by Lindberg. 180 feet long, electrically heated with 32 zones of control.

2 Lindberg is experienced in this type of service. Over a period of years, under certain conditions, it has been able to provide it to some industries. Now, with new plant and organizational facilities, this experience is available on a broader scale to help answer industrial heating and processing problems in most manufacturing fields.

3 For many years Lindberg's large technical staff and outstanding scientific laboratories have been recognized as leaders in metallurgical research. This background assures the technical know-how which you can depend on to provide the most effective and economical answer to your industrial heating and processing requirements.

4 Lindberg field-erected contracts are one-firm jobs. Modern plants, up-to-date equipment, experienced personnel and adequate material stocks assure that your installation will be completed on time and will operate with the full effectiveness planned for it.

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5 A management staff of long experience in this field directs this new Lindberg Division. The men pictured here have spent a collective total of 97 years in planning, designing, erecting and servicing industrial heating and processing equipment. You can afford to depend on their proven abilities in this field.

6 Every contract will have on-the-spot service from one of Lindberg's expert Field Engineers who are located in 22 cities throughout the country. This personal, close-at-hand service follows right through from the original planning to the final installation. Lindberg Branch Offices are located in these cities:

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Buffalo	Dallas	Indianapolis	Milwaukee	San Francisco	St. Louis
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To get the best possible help with your industrial heating and processing problems just call your nearest Lindberg Branch Office (you'll find the number in the Classified Telephone Directory or in the Trade Book Directories). One of our engineers will be on the job at once.

* *Lindberg Field-erected Division is ready to serve these industries: Aluminum, Automotive, Building Supplies, Copper & Brass, Ceramics & Glass, Plastics, Pulp & Wood Products, Steel and many others.*

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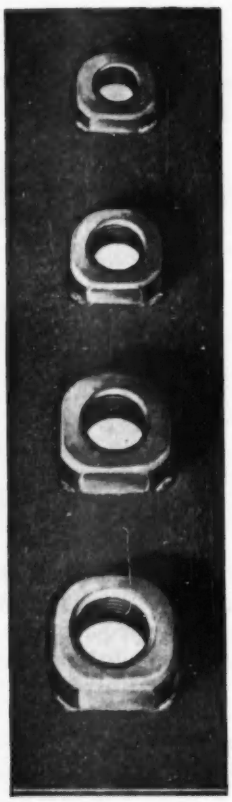

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Whether you're designing a product or building it, the Midland Welding Nut is the answer to the problem of accurately and securely fastening metal parts into a main assembly . . . speedily, economically.

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Britain's First Opposed-Piston Two-Stroke Diesel

(*Continued from page* 41)

and from the very small area of the water-cooled cylinder wall which is exposed during injection.

Mechanical efficiency is said to be improved by the low side thrust of the pistons due to the small angularity of their connecting rods which never exceeds five deg. In addition, friction is reduced by the exclusion of valves, springs, pushrods and camshaft.

These design features also minimize wear, reduce basic costs, and simplify maintenance. Smooth operation with little vibration is effected by the balance of reciprocating parts. The short, rigid crankshaft with lightly-loaded main bearings, and the elimination of out-of-balance forces, enhance stability and make a damper unnecessary.

Accessibility is another feature. Injector pump and auxiliaries are located on top of the engine. Rockers, bearings, pistons and other internal parts may be reached by removing the side covers. Access to exhaust ports for carbon removal is by removing the exhaust manifold, withdrawal of pistons being unnecessary for this operation.

This Commer Diesel, weighing 997 lb, is designed especially for underfloor mounting in passenger buses. It is currently being offered as an alternative to the gasoline engine on the "Avenger" forward-control coach chassis available with wheelbases of 15 ft, 9 in. and 17 ft, 6 in. The TS3 is not at present being supplied for export.

BOOKS . . .

JET AIRCRAFT SIMPLIFIED, *by Charles E. Chapel, published by Aero Publishers, 2162 Sunset Blvd., Los Angeles 26, Calif. Price, $2.75 (flexible cover); $3.75 (hard-bound cover).* This book explains in a step-by-step manner the basic principles and practical applications of the jet propulsion of aircraft. Among the many subjects discussed and illustrated with both line drawings and photographs are: the discovery of jet propulsion; simple examples of jet propulsion; the athodyd; the pulsejet; the turbojet; the turboprop; typical turbojets in production; airplanes powered by turbojet engines; guided missiles; pilotless aircraft; and rocket-powered aircraft.

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AIRTEX PRODUCTS INC.
FAIRFIELD, ILLINOIS

AIRBRIEFS

(*Continued from page* 82)

assembled at a remote base only in preparation for firing. More necessity than convenience, the Matador missile cannot be delivered "fly-away" at Baltimore. But the necessity for accurately-mated yet completely interchangeable assemblies placed great stress on Martin tooling methods. With this system, a final assembly line is eliminated and the various major assemblies are shipped direct from their respective departments. One complete Matador squadron is now in Germany and a second will be shipped this fall.

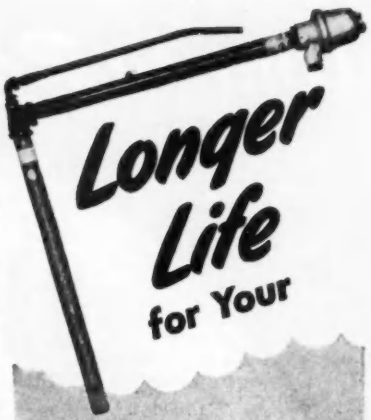
Flying Wing 'Copter

It is a great pity that few—if any—airline passengers have ever had a full view of the landscape from anything other than small, flush window in the wall beside them. Years ago pioneer designer John K. Northrop suggested a transport version of his Flying Wing with the passengers seated long the wing leading edge with an unobstructed view forward. Now Bell Aircraft Corp. is planning a Flying Wing helicopter with 40 passengers seated right in the leading edge of a wing. The rotors and engines are located at each end of the wing, landing gear is retractable and either engine will drive both rotors. The flight crew is located in a central pod ahead of the wing. The helicopter industry is now ready to produce a 40-passenger airline machine and Bell is equally ready to offer this novel and appealing arrangement to airlines.

British Are Coming

A British transport will shortly be operating on a U. S. airline for the first time in history. Capital Airlines has ordered three Vickers Viscount turboprop-powered airliners with an option for 37 more in the future. Powered by four Rolls-Royce Dart turboprop engines, the transports will also be the first turbine-powered airlines in U. S. operation. The Viscount will carry 48 passengers in first-class service and 56 passengers in a coach arrangement. They will cruise at 335 mph, which will cut 20 min from Capital's current schedule between New York and Cleveland and a half-hour from the Detroit-Washington route. In addition, the new transport will be much quieter

(*Turn to page* 126, *please*)



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Thermocouples used in liquid baths such as cyanide and salts have previously worn out rather rapidly owing to the fact that gases apparently pass right through the protecting tube, collect inside, contaminate the thermocouple and shorten its life.

The new Gordon vent-type thermocouple eliminates this collection of gases by providing a vent through which they are allowed to escape. It is also possible to blow a small amount of air from a convenient air connection through the tube to remove these gases.

Thus, by reducing contamination, the life of the thermocouple is greatly increased—often two or three times—and makes its life comparable with that of the tube itself.

This new type of thermocouple, by extending both the life and accuracy of your liquid bath thermocouples, offers you a real saving. One-half of all Gordon thermocouples are now supplied with this vent. Send for full information and price list.

Gordon also offers a full line of thermocouples and accessories of all types

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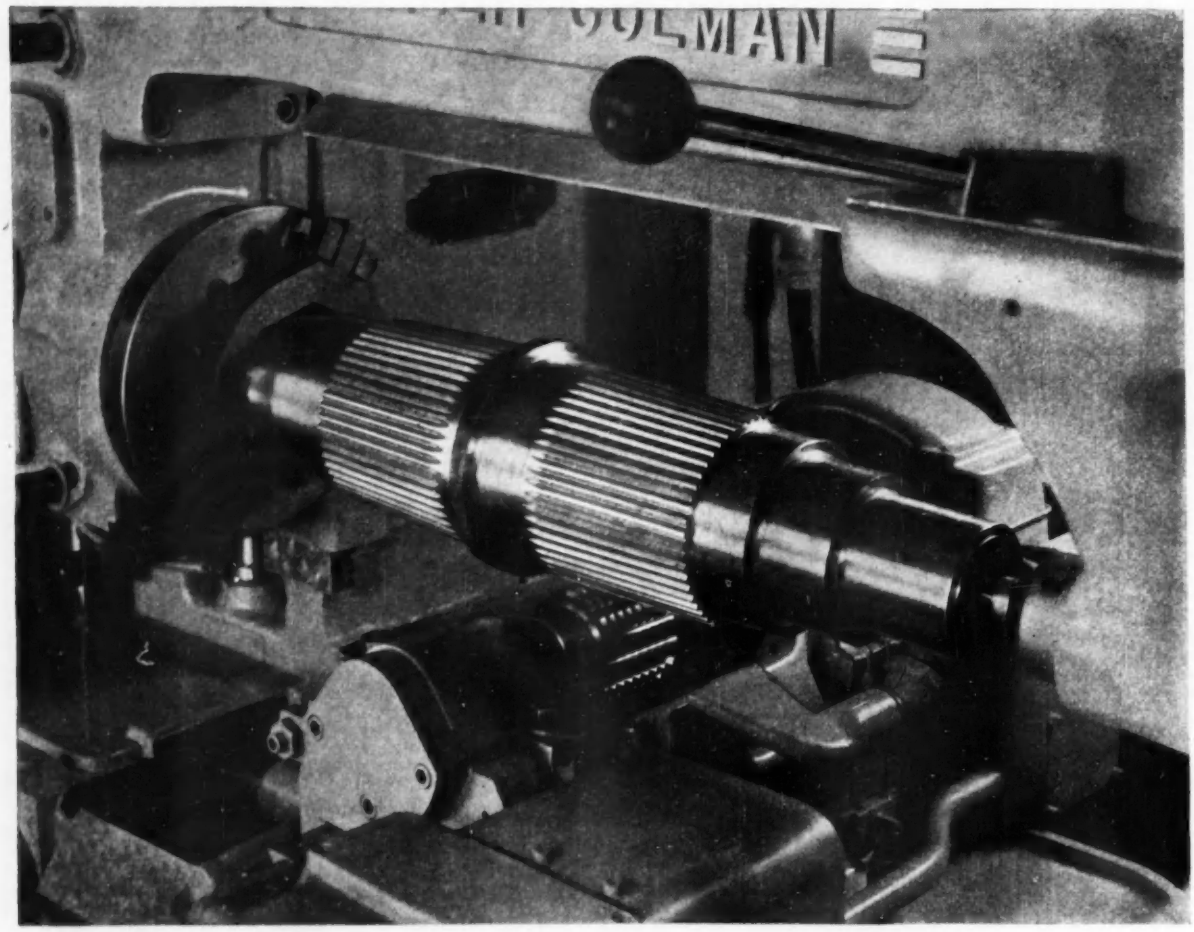


HEAVY TORSIONAL DRIVE USES TAPERED SERRATIONS

Hobbed On Specially Arranged Machines

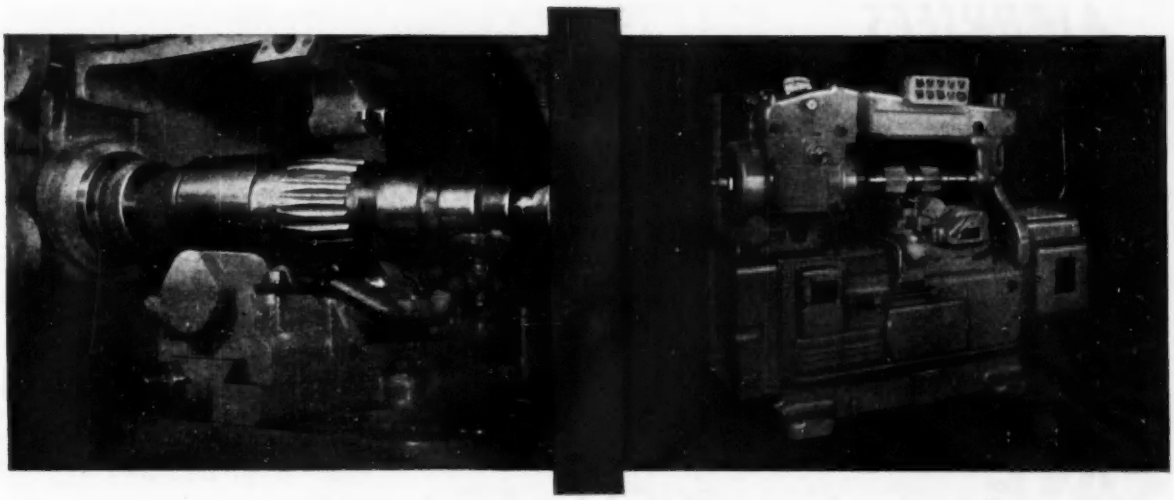
work slide and overarm swivel up to 5°

This Barber-Colman No. 16-16 Hobbing Machine is specially designed and arranged for hobbing tapered serrations. By swivelling the work slide up to 5° to obtain the desired cutting angle, several different tapers may be hobbed on the same machine. Once the proper set-up has been made, hobbing of tapered serrations proceeds according to standard hobbing technique.

Other than the special swivel arrangement on the work slide, universal joint on the worm shaft, and a cut-away outboard overarm support, this machine is of standard design and illustrates the practicability of adapting special work to standard hobbing techniques.

When not in use hobbing tapered serrations, this machine can be used for standard spur or helical gear work and straight splines. It is equipped with an Automatic Hob Shifter for maximum hob life.

BUILDERS OF PRECISION GEAR



metal-to-metal fit, wear compensation

Tapered serrations provide one of the best holding means for drives which have heavy and frequently-reversing torsional loads. The metal-to-metal side bearing fit eliminates relative rotation between members, and the taper provides for take-up to compensate for wear. Typical applications are heavy reversible drives such as tractor axles and hubs, and high-frequency reversible drives such as steering shafts and Pitman arms.

involute tapered serrations

Both involute and straight-sided tapered serrations may be produced by this hobbing method. The major illustration shows the hobbing of 10/20 diametral pitch involute serrations, ¾" taper per foot O.D., 54 teeth, and 6" major diameter. These teeth have a generated form with tapered root and outside diameter, the form changing continuously from the large to the small end. The mating part is swaged slightly undersize and the desired contact is obtained as a result of cold working the material in fitting the members. The swage is usually hobbed by the same set-up as the tapered shaft.

straight-sided tapered serrations

The second illustration shows the hobbing of straight-sided serrations using a single-position hob. These teeth are hobbed in 2-cuts and have straight sides with constant-width tooth spaces which permits the mating part to be broached to size after reaming to the correct taper. The internal mating part is broached one tooth at a time, providing a metal-to-metal fit which is not dependent upon cold working the material. Should looseness occur due to wear, it is taken-up on the tapered sides of the teeth.

Barber-Colman Engineers developed the special single-position hob for producing tapered serrations with a constant space width. They welcome special applications where this type of drive is an advantage and will be glad to furnish estimates on both hobs and machines for economically producing tapered serrations. Just send prints or samples marked for the attention of our Hob Engineers.

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GENERAL OFFICES AND PLANT, 617 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911

AIRBRIEFS

(*Continued from page* 122)

and virtually vibrationless. First Viscount is due to arrive early next year, several British customers having agreed to a delay in their order while the Capital order is rushed through "in the national interest." Capital, however, will have to get in regular line for its additional 37 aircraft, which wouldn't be completed until 1956-7. Meanwhile, Convair is rushing development on its turboprop-powered Liner to offer to Capital's competitors.

Flying LST

Aircraft design is easily one of the most obstinate fields of human endeavor with the desired configuration being ready for service in something like twice as long as originally hoped. It will be recalled way back during the war that the Navy called for a "Flying LST" which could deliver troops and cargo right up on beacheads after flying them thousands of miles. One result of this call is the unique Hughes Flying Boat—now carried on RFC books at $1.00. Convair has finally done the trick with its new R3Y-2 Tradewind flying boat, which features a hinged bow, which swings upward out of the way. Hydraulically-operated ramps extend forward from the bow to permit heavy trucks or tanks to move directly from the hull to the beach. The 80-ton monoplane can carry 24 tons of cargo for more than 2000 mi at nearly 400 mph. It is powered by four Allison T40 turboprop engines and is now in quantity production at Convair's San Diego plant. The call: 1944; the answer, 1954.

Eight Hour Decision

In one of its most crucial decisions, the Civil Aeronautics Board has agreed to waive its long-time rule that no flight crew can remain on duty longer than eight hours. It has agreed to permit airlines to schedule flight crews for 10 hours providing the duty is in connection with a non-stop transcontinental flight. Importance of the decision was generated by introduction of the Douglas DC-7 transport into the nation's first non-stop transcontinental service in both directions. The DC-7 cruises at 365 mph and makes the New York-Los Angeles flight in 7½ hours eastbound but has had difficulty in making the westbound flight in eight hours or less due to prevailing westerly headwinds. Although scheduled for 7 hours, 55 minutes, the flights had been repeatedly running to 8½ hours and more with resulting violations of the eight-hour rule. The CAB was faced with defending the personnel limitation at the cost of depriving the nation of non-stop transcontinental air service, and it chose the latter. The 10-hour limitation will also permit non-stop transcontinental service by the Lockheed Super Constellation which, although slightly slower than the DC-7, can make the trip in well under 10 hours. Meanwhile, the Air Line Pilots' Association, in defense of the eight-hour rule, is planning a strike of its pilots on such flights.

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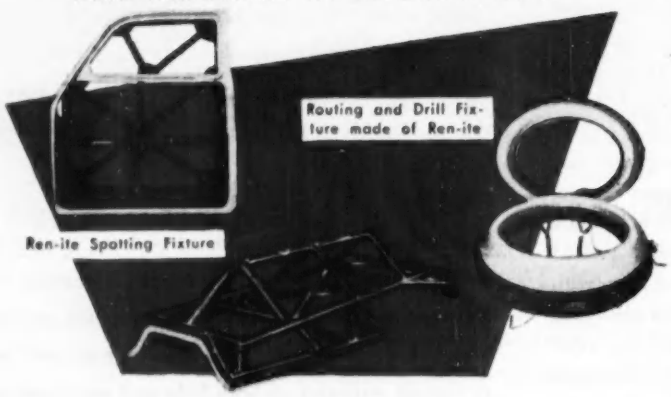
- CHECKING FIXTURES
- DRILL AND ROUTER FIXTURES AND MANY OTHER APPLICATIONS THROUGHOUT THE TOOLING INDUSTRY



Canopy Opening Checking Fixture, showing the use of Ren-ite Plastic stock tubing

REN-ITE is a modified Epoxy thermosetting resin for use as a laminating plastic without application of heat or pressure for general tooling applications. Cured, non-toxic, non-corrosive, easy to patch, not brittle, bonds to any material. Packaged in premeasured cans, complete with resin and hardener for immediate convenient use. We invite you to try Ren-ite products in your tooling program. Write for further information and price schedules on complete Ren-ite line.

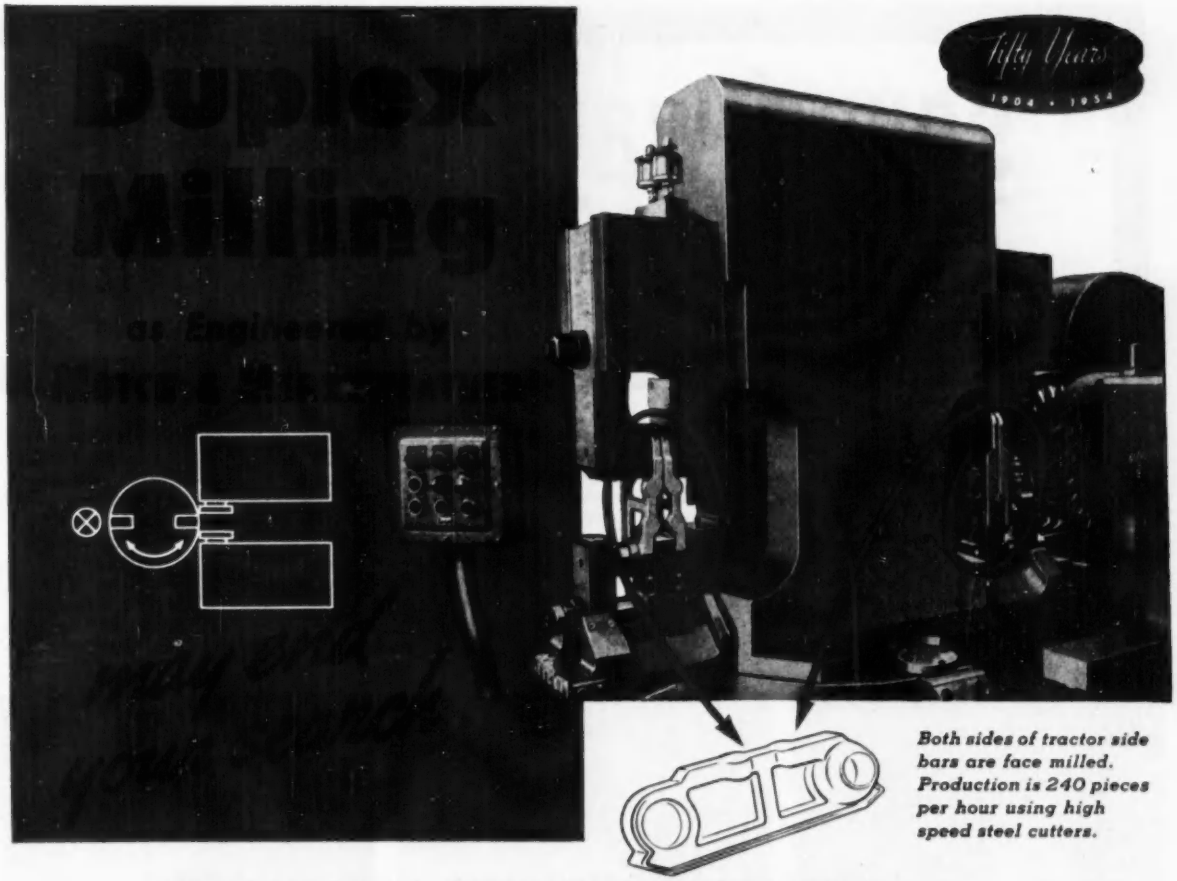
• FREE ENGINEERING SERVICE—NO CONTRACTS REQUIRED •

Ren•ite PLASTICS, INC.

POST OFFICE BOX NO. 1256, LANSING 4, MICHIGAN
OFFICES IN CHICAGO, CLEVELAND, DETROIT,
LOS ANGELES, NEW YORK AND ST. LOUIS.

"Ren-ite," "The Dimensionally Stable Tooling Plastic" and "Comminuted for Quality" are Trademarks of Ren-ite Plastics, Inc.

AUTOMOTIVE INDUSTRIES . . .
is your News Magazine of Automotive and Aviation
MANUFACTURING

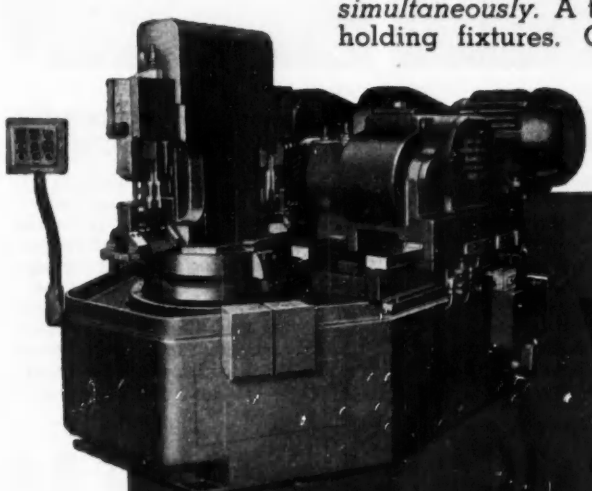


Fifty Years
1904 • 1954

Both sides of tractor side bars are face milled. Production is 240 pieces per hour using high speed steel cutters.

PRODUCTION CAN BE RAISED 50%
by Motch & Merryweather's *Duplex Milling Method!*

• Production milling is given new meaning by Motch & Merryweather's duplex method. Two heads mill two parts *simultaneously.* A table indexing 180° has two sets of work-holding fixtures. One operator unloads and loads during *duplex milling* at the opposite fixture. Fully automatic operation sets new production limits. Consult Motch & Merryweather about your production milling.



seven ways you save

WITH REYNOLDS FABRICATING FACILITIES

These photographs are representative of the tremendous Reynolds fabricating facilities . . . facilities that make possible seven basic economies to every manufacturer who uses Reynolds Aluminum Fabricating Service.

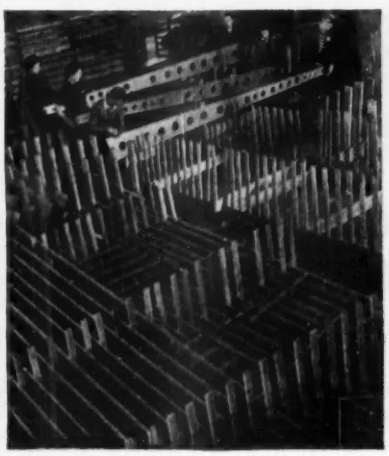
Not shown in these photographs, are two equally important advantages that Reynolds offers manufacturers. One, quality and production control from mine to finished product. Two, experienced design and engineering service.

You'll see *proof* of the latter advantages—along with proof of the seven basic economies pointed out in the photo captions—in each aluminum blank, roll formed shape, completed part or final assembly you get from Reynolds.

For your present needs or for development work on future models, contact your nearest Reynolds office listed under "Aluminum" in your classified telephone directory or write for your copy of the new "Complete Facilities" catalog to Reynolds Aluminum Fabricating Service, 2087 South Ninth St., Louisville 1, Ky.

2 **Reynolds REDUCES YOUR RAW MATERIAL INVENTORY**

You get *pounds of parts* instead of pounds of metal when you use Reynolds Aluminum Fabricating Service. Like the automobile manufacturer who will receive the extruded aluminum window frames above, you can save, too, by cutting out that costly part of your metal inventory that does not go into finished parts. Over 30 Reynolds plants in 18 states are at your service!



3 **Reynolds RELEASES YOUR VALUABLE FLOOR SPACE**

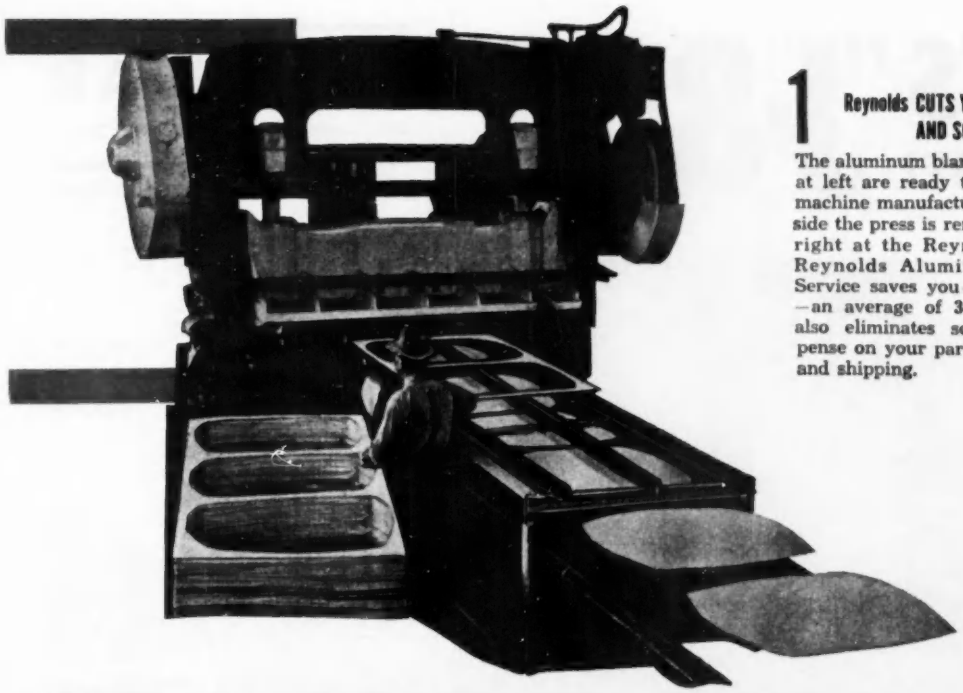
Pictured above are just a few of 6,000 *different parts* for a single plane in production at Reynolds plants at one time during World War II. Imagine the floor space required for this production. Imagine the floor space *you* can save in *your plant*—space you can put to profitable use—when you call on Reynolds Aluminum Fabricating Service to turn out aluminum parts for your products.

4 **Reynolds ADDS TO YOUR CAPACITY WITHOUT INCREASING COSTS**

Here, in the photograph above, aluminum TV antenna is being formed on one of the seventeen Reynolds roll forming machines. The great variety of Reynolds specialized equipment enables you to obtain the economy of the machines best suited to your purpose, without making the tremendous capital investment in equipment and added plant capacity which would otherwise be required.

REYNOLDS ALUMINUM

BLANKING • EMBOSSING • STAMPING • DRAWING • RIVETING • ROLL



1 Reynolds CUTS YOUR SCRAP LOSS AND SCRAP HANDLING COSTS

The aluminum blanks on the conveyor at left are ready to go to a washing machine manufacturer. The scrap beside the press is remelted immediately right at the Reynolds plant. Thus Reynolds Aluminum Fabricating Service saves you—the manufacturer—an average of 30% scrap loss and also eliminates scrap handling expense on your part in sorting, storing and shipping.

5 Reynolds CUTS YOUR MATERIAL HANDLING COSTS

The aluminum pallets above will reduce material handling costs in many plants . . . and the manufacturer of these pallets is also reducing *his* material handling costs by getting *pounds of parts,* not pounds of metal, from Reynolds Aluminum Fabricating Service. Reynolds also takes the problems of scheduling, material supply, labor and machine availability off his—and your—hands!

6 Reynolds RELEASES YOUR WORKING CAPITAL

When you use Reynolds Aluminum Fabricating Service you receive 100% of your aluminum in finished parts. And, as these parts are generally assembled into finished products before invoices come due, no investment is tied up in raw metal. These quality parts, like the shells of the aluminum cookers being buffed above, are available in a wide choice of finishes including color-anodized.

7 Reynolds ELIMINATES YOUR REJECT COSTS

Reynolds Aluminum Fabricating Service does away with your machine and labor production losses and inspection expense in rejects, because you pay only for finished, inspected parts. The conveyor line above, where refrigerator door trays are carefully inspected before packing and shipping, is just one of the many examples of Reynolds quality control from mine to finished product.

See "Mister Peepers" Sundays on NBC-TV. Consult local listing for time and station.

FABRICATING SERVICE

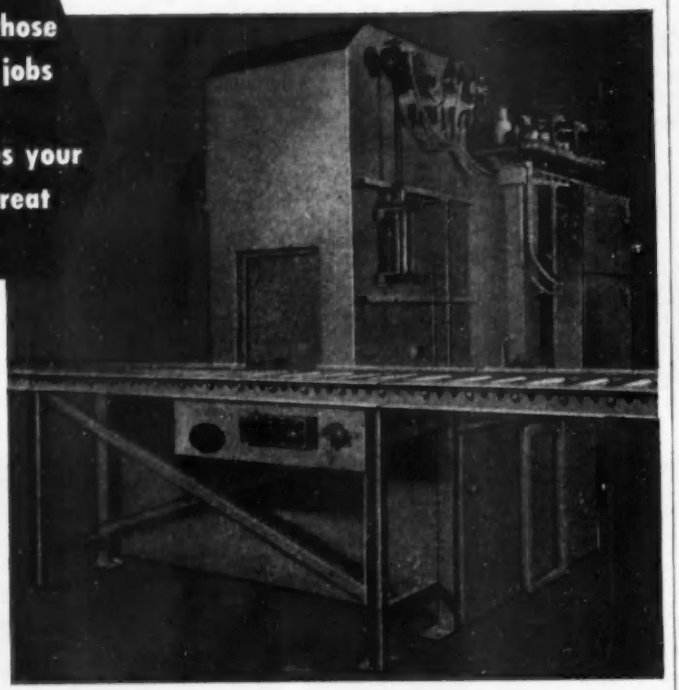
SHAPING • TUBE BENDING • WELDING • BRAZING • FINISHING

DOW'S "J-800" MODEL

Licks those tough jobs

●

Slashes your heat treat costs!



"NO-GAP" OPERATION—A batch type furnace with less than 30 seconds between loads. Work chamber is never exposed to air. Loading is accomplished while slow cooling or quenching a previous load.

GREATER PRODUCTION—Actual field operation has proven conclusively that the Dow Model J-800 will easily bring 800 pounds from room temperature to 1500° F in less than one hour.

COMPACT CONSTRUCTION—Occupies floor area of only 7'10" x 14'4" giving maximum production for minimum floor space.

VERSATILITY—Ideal for carbonitriding, gas carburizing, clean hardening and carbon restoration. Hot oil quenching and atmosphere cooling equipment available.

EXCLUSIVE FEATURES—High capacity fan combined with heat capacitor assures uniform case depth throughout each load • Forced circulation of quench oil assures uniform hardness with minimum distortion • Sealed quench tank gives cleaner stock—minimizes fire hazard.

DOW FURNACE COMPANY

First WITH MECHANIZED, BATCH-TYPE, CONTROLLED ATMOSPHERE FURNACES

12045 Woodbine Ave., Detroit 28, Mich.
Phone: KEnwood 2-9100

CALENDAR

OF COMING SHOWS AND MEETINGS

Truck-Trailer Manufacturers Association, summer meeting, Edgewater Beach Hotel, Chicago, Ill. July 22-23

SAE West Coast Meeting, Los Angeles, Calif. ..... Aug. 16-18

National Fluid Power Association, fall meeting, Hotel Commodore, New York, N. Y. ..... Sept. 7-9

Society of British Aircraft Constructors, exhibition and flying display, Farnborough, England Sept. 7-12

ASME Fall Meeting, Schroeder Hotel, Milwaukee, Wis. ... Sept. 8-10

SAE National Tractor Meeting, Hotel Schroeder, Milwaukee, Wis. Sept. 13-16

First International Instrument Congress and Exposition, Philadelphia, Pa. ..... Sept. 13-24

Fourth European Machine Tool Exhibition, Milan, Italy .... Sept. 14-23

National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J. ..... Sept. 15-17

Society for Experimental Stress Analysis, annual meeting and exhibition, Bellevue-Stratford Hotel, Philadelphia, Pa. .. Sept. 21-23

ASME Annual Engineering Conference, Statler Hotel, Los Angeles, Calif. ..... Sept. 27-30

National Industrial Packaging and Materials Handling Exposition, Chicago, Ill. ..... Sept. 28-30

Association of Iron and Steel Engineers, annual convention and exposition, Cleveland, O. Sept. 28-Oct. 1

SAE National Aeronautic Meeting, Statler Hotel, Los Angeles, Calif. ..... Oct. 5-9

Paris Automobile Show, France. Oct. 7-17

National Conference on Industrial Hydraulics, Sheraton Hotel, Chicago, Ill. ..... Oct. 14-15

SAE National Transportation Meeting, Sheraton-Plaza Hotel, Boston, Mass. ..... Oct. 18-20

National Safety Congress and Exposition, Chicago, Ill. ..... Oct. 18-22

International Motor Show, Earls Court, London, England ... Oct. 20-30

American Gear Manufacturers Association, semi-annual meeting, Edgewater Beach Hotel, Chicago, Ill. ..... Oct. 24-27

National Lubricating Grease Institute, annual meeting, Mark Hopkins Hotel, San Francisco, Calif. ..... Oct. 25-27

SAE National Diesel Engine Meeting, Statler Hotel, Cleveland, Ohio ..... Oct. 26-28

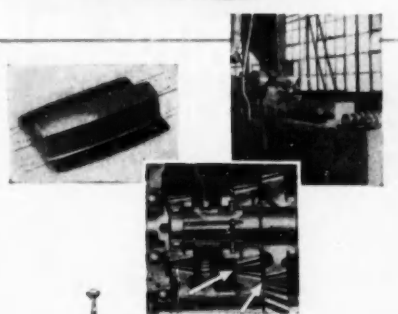
National Metal Congress and Exposition, International Amphitheatre, Chicago, Ill. ..... Nov. 1-5

SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla. ..... Nov. 4-5

Pan-American Road Race, Mexico Nov. 19-23

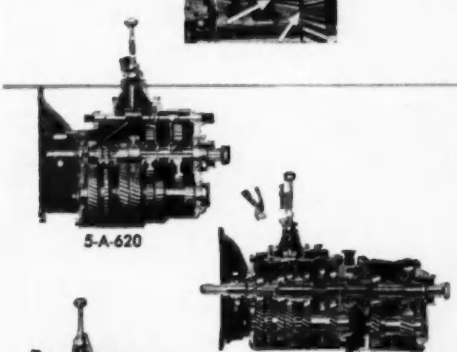
Demand from the field

Ask the driver—the man who has to maintain engine rpm to meet round-trip schedules. Ask the mechanic—the man who has to keep the truck *on the road*. Ask the owner—the man who has to pay the bill if the transmissions fail. They'll tell you they want a Fuller Transmission . . . *for Fuller has the features for more profitable trucking.*



Fuller design features

Open up a Fuller Transmission . . . and you can see the "extras" Fuller provides. Take a Fuller-equipped truck out on the road and *feel* it perform. Constant mesh, helical gears mean easier, faster shifting in forward speeds. Crowning the gear teeth prevents stress . . . longer life for Fullers. Shot peening reduces metal fatigue . . . less material failure.



110 Models—100 to 400 hp

Specify a Fuller Transmission for your on- or off-highway units and get a transmission *matched* to your load and road conditions . . . that will provide the right ratios for your job. Specify a transmission *designed to deliver* more effective horsepower . . . a Fuller Transmission.

where horsepower *really* goes to work

Fuller TRANSMISSIONS ®

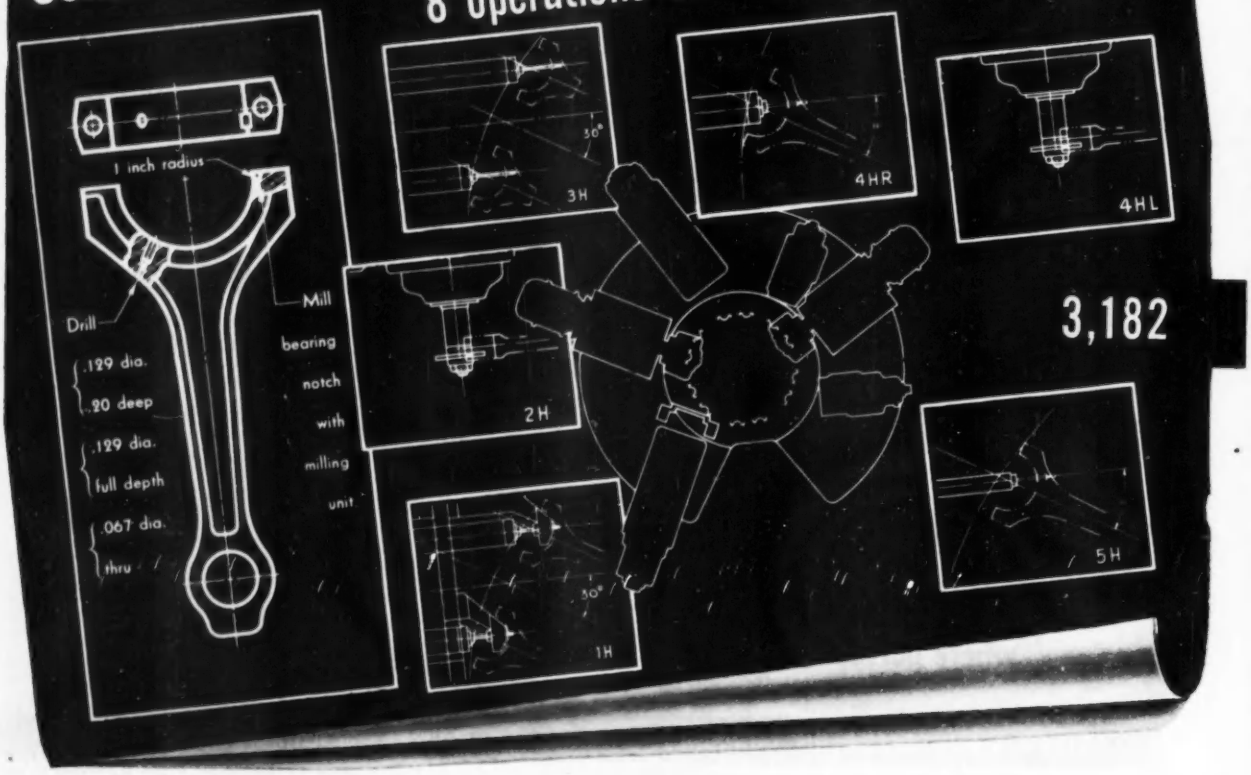
FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO, MICHIGAN

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Western Dist. Branch (Sales & Service, All Products), 641 E. 10th St., Oakland 6, Cal.

"Operations Kingsbury" . . . required accuracy, low cost, high

Connecting Rod Forged Steel 8/10¢ each

8 operations on 2 parts in one cycle



production for interchangeability

Here are two Kingsburys, custom-built to serve in widely separated product fields. Each justifies its investment. One drills a small hole and mills a notch in a forged steel connecting rod. The other works on a cast aluminum sole plate for a steam iron: drills 26 holes and spot-faces a boss.

Could this work be done on single-operation machines? "Yes." But could the connecting rods be machined for eight-tenths of a cent each? And the sole plates for one-and-one-fifth cents each?

Kingsburys have so many advantages. For example: One work fixture positions the part for each successive operation. Standard units perform the operations within a pre-determined time cycle to obtain the best output with required accuracy. Tolerances are held to specifications. Scrap loss is reduced to a minimum. Floor space is saved. Handling is reduced. One operator loads and unloads the machine. And your parts will be interchangeable, reducing your assembly time.

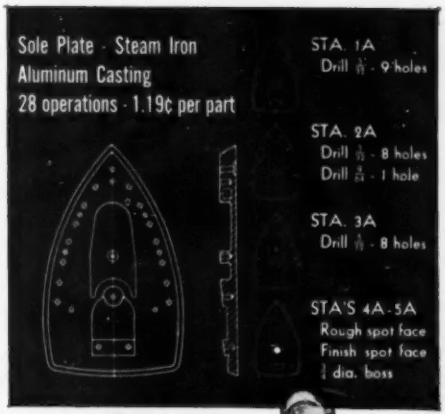
You can drill, spot drill, flat-bottom, ream, burr-ream, counterbore, countersink, mill, end-mill, hollow-mill, tap, thread, face, spot-face, form, recess, saw, trepan . . . all within certain limitations. For instance: Your product must be such that it can be machined within the limits of 5 HP units, and of a size and/or weight that can be handled efficiently by an operator.

We have some interesting bulletins we shall be glad to send you. Perhaps you manufacture a part where a few cents saved would put you in a better profit position and pay for the cost of a Kingsbury. Let's talk it over.

Kingsbury Machine Tool Corp.
107 Laurel Street, Keene, N. H.

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production



Steam Iron Sole Plate- Cast Aluminum 17,920 operations per hour

Here's a case where a Kingsbury really "gangs up" to get the work out! The part is a cast aluminum sole plate for a steam iron; 26 angular holes to be drilled and one boss to be spot-faced.

The machine has an 80-inch base and a 20½-inch diameter index table with 7 fixtures. Five drilling units are mounted on the base. Two of these have 9 spindles each, one has 8 spindles and two have single spindle heads to perform the rough and finish spot-facing operations on one ¾-inch boss. Bushings guide all tools.

The table indexes through five working stations. At Station 6, work is unclamped automatically and removed by the operator. At Station 7, the operator places new work in the fixture, where it is clamped automatically.

Operations per hour on two forged steel connecting rods

The problems: to drill a concentric step-down hole thru, at an angle of 30°, in each of two connecting rods; also to mill a notch in each rod for the bearing.

To obtain high production at low cost per part, the machine was designed to handle *two* parts in each work-holding fixture. Six Horizontal (H) Units are mounted radially on an 80-inch base. The 26-inch index table has six of these "twin" work-holding fixtures, automatically clamped and unclamped. The machine indexes through five work stations where eight operations are performed. The longer holes are drilled in two operations to maintain a balanced time cycle at each station. Bushings guide all drills.

Station 1, Unit 1 H has two-spindle head and drills one .129 dia. hole at an angle of 30° in each rod to half the required depth.

Station 2, Unit 2 H with milling unit mills the notch in the *right* hand part.

Station 3, Unit 3 H has two-spindle head and completes the drilling of the .129 hole in each rod.

Station 4, Unit 4 HR is a single spindle unit with sensitive feed; drills .067 hole thru from bottom of .129 hole in *right* hand part. *Unit 4 HL* with milling unit mills the notch in the *left* hand part.

Station 5, Unit 5 H is a duplicate of Unit 4 HR: drills .067 hole thru from bottom of .129 hole in *left* hand part.

Station 6: operator removes the two finished parts and replaces them with two new parts. Parts are unclamped and clamped automatically in the work fixture.

ON OUR WASHINGTON WIRE

At presstime, there was every indication that FTC is set to deny an appeal by Harley-Davidson Motor Co. from a hearing examiner's initial decision. That decision held that Harley-Davidson's agreements with its franchised dealers, allegedly requiring them to deal exclusively in its motorcycles, equipment, parts, accessories, and oil, had the effect of lessening competition and, therefore, violated a section of the Clayton Act.

JOHNSON
Tappets
"fill the exacting requirements of today's engines"

Higher horsepower and higher compression put heavier loads on the tappets. Johnson quality assures you the performance you want from these vital engine parts.

"Tappets are our business"
JOHNSON Jp PRODUCTS INC.
MUSKEGON, MICHIGAN

Removal of independent automobile parts wholesalers from coverage by the Government Wage-Hour law looks very unlikely. The wholesalers contend they should be released from coverage so as to be on an even basis with car dealers who sell parts. U. S. Labor Dept. heard this proposal recently, but it did not act.

First purchases by the Government of machine tools for the "mothball" defense plant program may get under way late this year. Congress is expected to approve shortly the Defense Dept. request for a one-year extension of a $250 million fund for tool purchases.

Building of $85 million worth of military planes in Britain for use by the Royal Air Force will be financed by the U. S. These planes, the number of which is undisclosed, are for delivery by June 30 next year.

Publication of the Government's new manual of disaster advice to the metalworking industries now is scheduled for around Aug. 1. It should be of value to every level of management in planning for plant operation under emergency conditions.

Strategic dispersal of storage sites for critical materials making up the national stockpile is being pushed along by the Government. The policy is in line with the Federal program for building new defense plants a minimum of 10 miles from target areas.

STAINLESS STEEL FOR TRANSPORTATION

McLouth STAINLESS Steel

High quality stainless sheet and strip steel . . . for the product you make today and the product you plan for tomorrow.

McLouth Steel Corporation
DETROIT, MICHIGAN
Manufacturers of Stainless and Carbon Steels

CLEANING SPECIALISTS

give you a "brighter" outlook on life.

It's amazing how pleasant the view can be after one of these steel-nerved, sure-footed, alert Cleaning Specialists have done their job.

Northwest's Metal Cleaning Specialists are "alert" to your problems when it comes to giving your products a "brighter" outlook. Day in—day out, Northwest carries on the constant search for better, lower cost, analytically-correct cleaners to give you dependable, good looking, permanent finishes.

Remember —YOUR COST PER FINISHED ARTICLE IS THE TRUE COST OF YOUR CLEANER

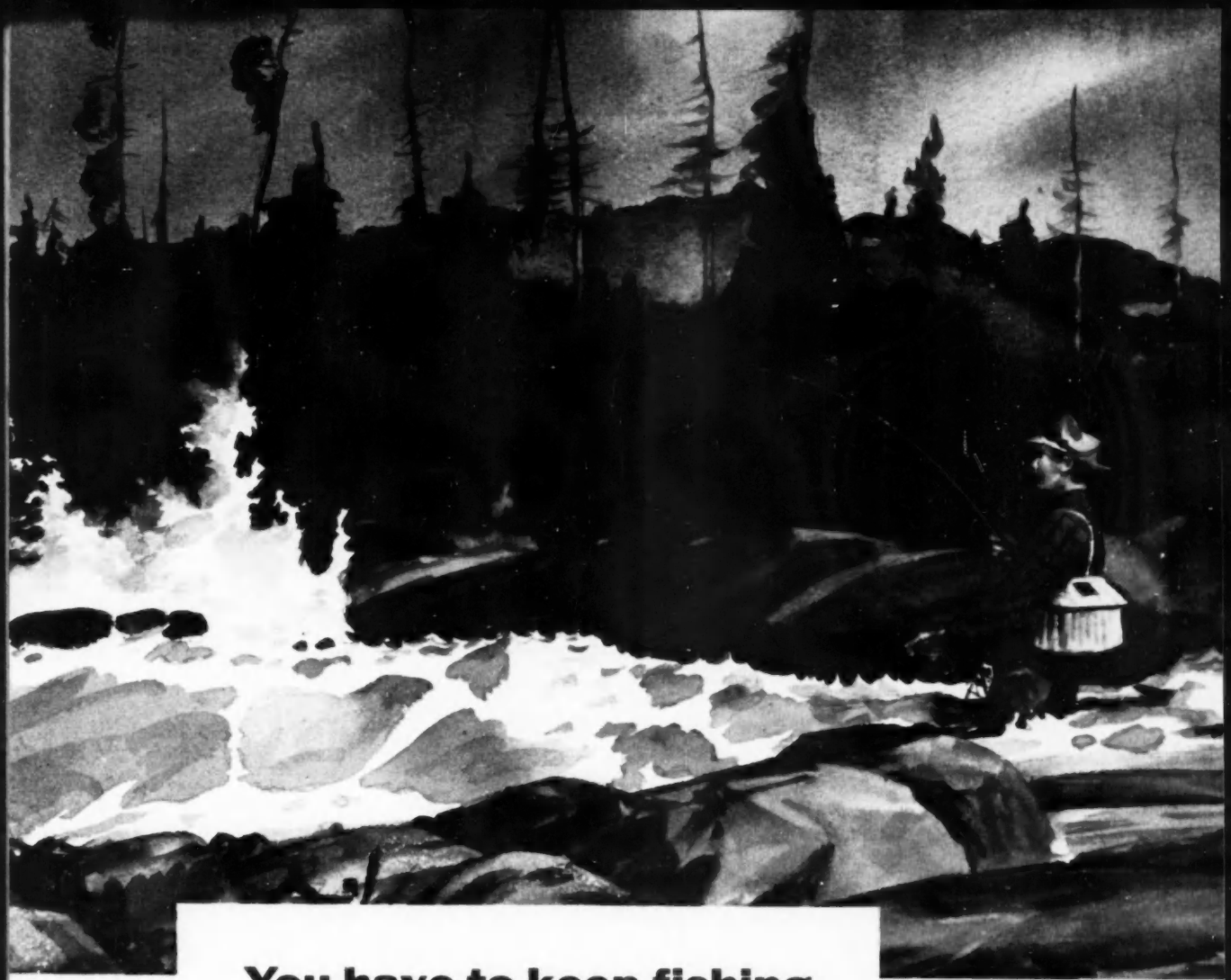
From Northwest's years of experience in developing job-adjusted cleaners for your specific needs have come such processes as the LO-HI pH—for cleaning prior to plating, painting or vitreous enameling; ALKALUME—for preparing aluminum for finishing and spot welding; INTERLOX—for phosphate coating; SPRA-LUBE—to control over-spray of "today's" paints in water wash paint booths; PAINT STRIPPERS—specific to your needs; SUPER-DRAW & FLUID FILM—for drawing metals.

Northwest's production-tested chemicals and "Right-the-first-time" recommendations will save you money. Northwest Service is as close as your phone.

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control *serving you since '32*



You have to keep fishing

... if you want to keep your skill

Spicer has been in the center of the stream
of automotive progress for 50 years.
Consistently . . . *year after year for a half-century* . . . Spicer has built
up a rich fund of power transmission knowledge and skill.
In peace and war . . . in every phase of civilian and military service . . .
Spicer automotive equipment has convincingly demonstrated why
it has earned the reputation of

"The Standard of the Industry"

ENGINEERING
DANA
MANUFACTURING

SPICER
POWER TAKE-OFFS

...built with the skill gained from 50 continuous years of experience in power transmission design

Spicer Power Take-Offs and Spicer Power Take-Off Joints embody all the advantages of Spicer engineering, Spicer precision manufacturing, and Spicer dependable performance. These units are available in a wide range of models to meet every service requirement. They are more widely used than any other similar type of equipment.

Spicer engineers offer the benefit of their vast experience to assist you in the adapting of Spicer Power Take-Off units to the particular needs of your product. Spicer Power Take-Offs are designed to meet all operating conditions of continuous or intermittent service. They include Medium and Heavy Duty Single, Dual and Reversible Speed Models for all service vehicles. For many years Spicer units have been

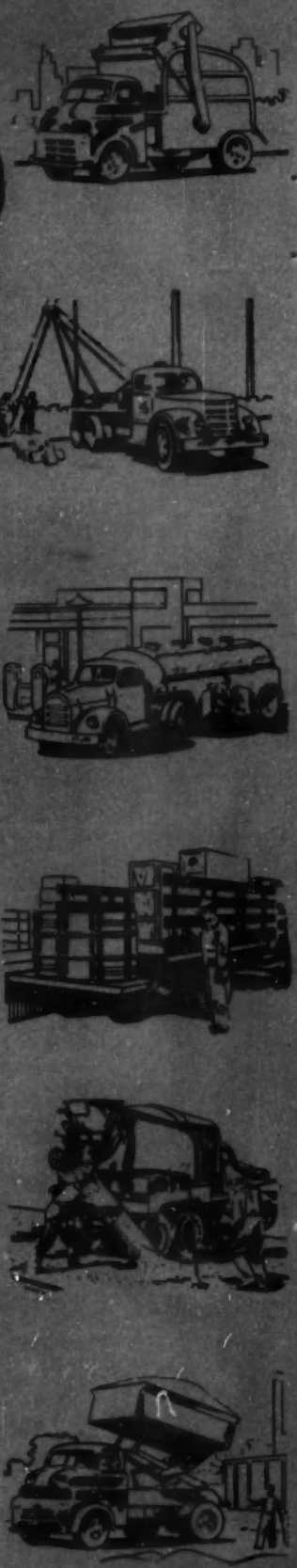
"Preferred by the Trucking Industry!"

SPICER MANUFACTURING DIVISION
of Dana Corporation
Toledo 1, Ohio

50 YEARS OF Spicer SERVICE

ENGINEERING
DANA
MANUFACTURING

TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • BROWN-LIPE and AUBURN CLUTCHES • FORGINGS • AXLES • STAMPINGS • SPICER BROWN-LIPE GEAR BOXES • PARISH FRAMES • TORQUE CONVERTERS • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • AIRCRAFT GEARS • WELDED TUBING



Business Pulse

(*Continued from page 78*)

What some observers regard as a partial answer to this question was given in a recent press conference by Dr. Arthur F. Burns, chairman of the Council of Economic Advisers. Dr. Burns was reported to have said that the existing level of unemployment was not regarded as one that could be accepted indefinitely. This statement was considered the most definite indication yet given by a Federal official that an unemployment total of 3½ million, if it should continue, would eventually be interpreted as a signal for Federal action, presumably on a larger scale and perhaps over a broader front than such action has yet covered.

Dr. Burns did not indicate how soon measures of this kind might be expected or what forms they might take. It is worth noting, however, that unemployment normally rises during the summer with the influx of students and graduates into the labor force. This increase is of no lasting significance, but it could be used by those favoring governmental intervention as a means of bringing additional pressure upon the Administration.

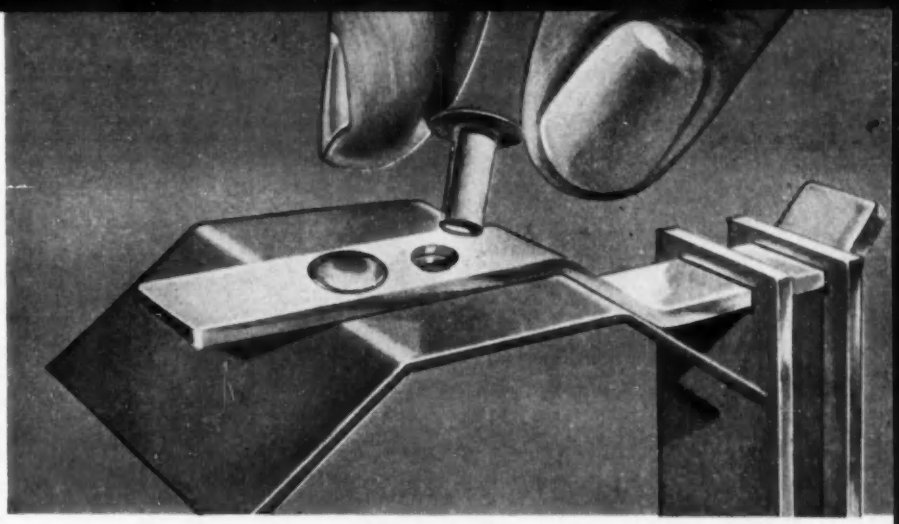
Fewer Unemployed

The decline in unemployment from April to May was very small—from 3,465,000 to 3,305,000, according to the official estimates. In recent years, May has usually brought a larger decline. In fact, it is thought possible that a decrease of this magnitude may be due to errors of sampling. Only in agriculture and construction were there any signs that previously unemployed workers were being absorbed.

Reports on unemployment insurance claims, however, tend to support the view that there has actually been a change for the better in the employment picture. Moreover, this improvement seems to have continued at least through the greater part of June.

Longer Work Week

An especially encouraging feature of the labor situation is the upturn in the length of the work week from April to May. The increase was not large, but it followed two successive



You Enjoy The Economy Of Quality With Townsend Tubular Rivets

If you use tubular rivets in your assembly operations you know that uniform physical properties and accurate dimensions are essential to efficient operation. We, at Townsend, know it too. That is why wire of the proper grade and analysis is drawn to specifications in our own wire mill to assure positive control of the quality you enjoy when using Townsend tubular rivets.

Since tubular rivets are set with comparatively little pressure, they are often used in materials which cannot stand the impact required to set solid rivets. In these cases the uniform ductility of Townsend tubular rivets is doubly important.

Townsend tubular rivets feed readily into any make of automatic machine—may also be set easily by hand. Their appearance is good—adds to the attractiveness of your product. They weigh less than many other types of fasteners—reduce product weight.

The majority of Townsend semi-tubular rivets are made with an extruded hole which is tapered. When set, there is more material in the clinched end which produces great holding power and develops a shear strength comparable to other fasteners.

Townsend tubular rivets are used extensively in the electrical industry for assembling radio and television sets—in the automotive industry to assure safe, positive fastening of lining to brake shoes—in the furniture industry and many others where quick, secure, economical assembly is desired. These rivets are available in a wide range of sizes in steel, brass, aluminum and copper.

In addition to being the world's largest manufacturer of a complete line of rivets, Townsend has become known as "The Fastening Authority"—has developed special skills and accumulated experience in assembling products of metal, wood, plastics, fabrics and glass. This knowledge enables Townsend engineers to help select or design the fastener best suited to your product and assembly methods. They have over 10,000 special and standard items to draw upon. Also, Townsend's tremendous capacity of 60-million pieces daily is your assurance that delivery will keep pace with your production. You can depend upon Townsend as a reliable source of quality fasteners at a reasonable cost. To enjoy the economy of quality—specify Townsend fasteners.

Townsend

COMPANY • ESTABLISHED 1816

NEW BRIGHTON, PENNSYLVANIA

Sales Offices in Principal Cities

Cherry Rivet Division • Santa Ana, California

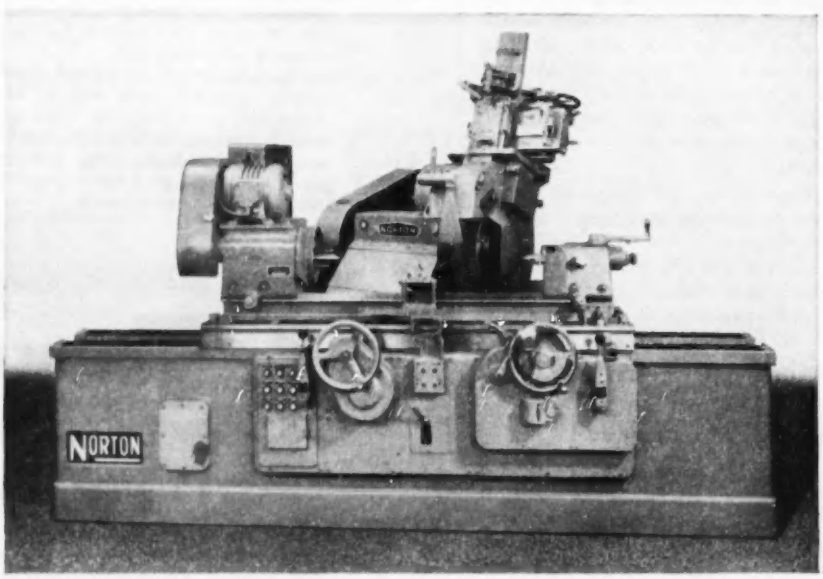
THE FASTENING AUTHORITY—Experience: *over 138 years*—**Capacity:** *sixty-million parts daily*—**Products:** *over ten-thousand types of solid rivets–cold-headed parts–Cherry Blind Rivets–Twinfast Screws–self-tapping screws–tubular rivets–locknuts–special nails–formed wire parts.*

Plants: *New Brighton, Pa.—Chicago, Ill.—Plymouth, Mich.—Santa Ana, Calif.*

In Canada: *Parmenter & Bulloch Manufacturing Company, Ltd., Gananoque, Ontario*

With the

Thrust Surface And Adjacent Diameter are both ground at once on the new Norton Type CV-4 semiautomatic wheel-slide grinder. And you get better quality results! Because this machine leaves a concentric grain pattern in the thrust surface finish — assuring a better seal surface and appearance than side wheel grinding can produce.



The Type CV-4 is available with hand table or hydraulic power table drive in swing capacities of 10″ and 14″, and work lengths of 18″, 36″, 48″ or 72″.

Norton Type CV-4 Semiautomatic Angular Wheelslide Grinder

you can do several grinding jobs at once

Now you can grind thrust surfaces and adjacent diameters in one automatic plunge grind operation! The new Norton Type CV-4 semiautomatic angular wheelslide grinding machine eliminates the separate operation on the shoulder or thrust surface that is normally necessary with conventional cylindrical grinders.

This alone means important savings in time and labor costs. And you get plenty of additional benefits from the Type CV-4's rapid grinding action, simplified operation and top-quality production.

Improved grinding wheel feed

The automatic wheel feed includes a "click-count" index, enabling settings for work diameter reduction in increments as fine as .0001" — instantly. Graduated wheel feed hand wheel, located to eliminate reaching, indicates amount of feed as it rotates. Both length and rate of automatic wheel feed easily adjusted from operating position.

Simplified operation

Operator merely loads; starts automatic cycle, and unloads. Fatigue is decreased, helping prevent production lag.

The automatic wheel guard truing device (optional) provides additional operating ease. Push-button control of straight, stepped or formed truing eliminates need of skill and reduces wheel cost per piece ground. In addition, the Type CV-4 can be easily adapted to special jobs with Norton-engineered chucking heads, locating and loading-assist equipment for greater productivity.

Easier, lower cost maintenance

Ramped outlet from coolant tank speeds clean-out . . . pumps and motors all outside and easy to reach . . . electrical controls all grouped in raised enclosure . . . base ways protected by steel tape guards, requiring no additional floor space . . . hydraulic oil and ways lubricant carried in outside reservoirs with large gauge-glasses.

For your own grinding jobs

investigate the many advantages of the new Norton Type CV-4 semiautomatic angular wheelslide grinder. See your Norton Representative or write direct for Catalog. And remember — only Norton offers you such long experience in both grinding wheels and machines to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

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GRINDERS and LAPPERS

Making better products . . . to make other products better

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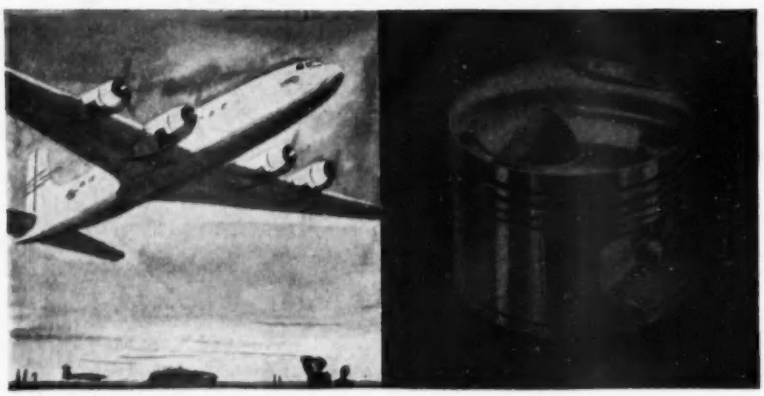
Ice Scoops and Aircraft Pistons



Thompson Precision-Engineers Light Metal Castings for All Industry

YES, there *is* a connection—both ice scoops and aircraft pistons are products of Thompson's versatile Light Metals Division.

Ice scoops, used in making cold soft drinks, and pistons, used in high speed aircraft engines are but two of the many light, strong, durable castings being designed, developed and produced by Thompson's exacting engineers.

Over 50 years experience in research and manufacture of precision metal parts enables Thompson today to offer aid to all forms of industry. Thompson is now producing light metal castings for such diversified products as aircraft and washing machines; buses and garbage disposers; tractors and outboard motors; automobiles and industrial engines.

Regardless of your product, if you use castings, Thompson's creative engineers will gladly show you where and how you can simplify your operations and save on costs with Thompson Light Metals Castings.

For a detailed description of the Thompson Light Metals facilities which are available to you, send for your free copy of "Creative Castings." Just write to Dept. AI-9, Light Metals Division, Thompson Products, Inc., 2269 Ashland Rd., Cleveland 3, Ohio.

You can count on

Thompson Products

LIGHT METALS DIVISION
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Business Pulse

(*Continued from page* 139)

monthly declines and took on added interest because of the tendency in the past for changes in the work week to anticipate general business fluctuations, both on the upward and downward side.

Retail trade increased less than seasonally from April to May, according to the preliminary estimate. On a seasonally adjusted basis, the May level was one per cent below that in April and three per cent below that a year ago. Incomplete data for June, however, are on the favorable side. Department store sales have shown increasingly favorable comparisons with the 1953 figures week by week. This improvement seems to bear out the view that retail business was restricted by adverse weather conditions in many areas during a large part of the spring season, indicating the likelihood of a pickup with the advent of milder weather.

Consumer Spending

Reports like these are favorable enough to make some observers believe that total consumer spending made a larger contribution to total business volume in the second quarter of the year than in the first. If so, the increase in spending was apparently at the cost of saving, since there has been no sign of a rise in personal income. The latter continued in April to show the gradual decline that had been under way since July of last year. If the share of income saved did decline in the second quarter, the development would be of exceptional interest, as it would mark the reversal of a tendency that had been continuously apparent since the second quarter of 1953.

A further slight decrease in business expenditures for plant and equipment during the third quarter is indicated. Nevertheless, these expenditures will still be in very large volume, if reported plans are carried out. The indicated total for the third quarter is $26.79 billion, as compared with the all-time peak of $28.92 billion in the corresponding period last year. The greater part of the aggregate decline is accounted for by manufacturing and railroad companies. Most other divisions of industry report only slight curtailment, and this is largely offset by an increase in ex-

"Wagner Air Brakes ...boosted our brake service mileage 30% before general overhauling was necessary."

says:

JOHN M. DILLION
Gen. Supt. of Maintenance
KEESHIN MOTOR EXPRESS CO., INC.

KEESHIN MOTOR EXPRESS CO., INC.
IN REORGANIZATION CASE 46-B-25
N. E. DISTRICT ILLINOIS

WILLIAM P. BOGHAM
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TRUSTEES

201 WEST PRESCOTT ROAD
CHICAGO 3, ILLINOIS
TEL. WABASH 2-4100

Wagner Electric Corporation
6400 Plymouth Avenue
St. Louis 14, Mo.

Dear Sirs:

Keeshin drivers log a lot of miles while hauling throughout the east and middlewest. It's natural in a fleet as large as ours, to put extra emphasis on safety and performance. So, as general superintendent of maintenance I make sure I specify parts and equipment that will help lengthen the service life of vehicles and keep maintenance costs at a minimum.

I am especially happy to report that Wagner Rotary Air Compressors more than meet the requirements we have set for safety and dependability. As long as these compressors have been in operation at Keeshin, we have had no compressor failure, no valve trouble, or road failure due to lack of adequate air pressure.

All in all, our experience and records clearly show that Wagner Air Brakes are more economical to maintain and have boosted our brake service mileage 30% before general overhauling was necessary.

Sincerely yours,
John M. Dillion
John M. Dillion,
Gen. Supt. of Maintenance

The record of Wagner Air Brakes speaks for itself. Men, like John Dillion of Keeshin Motor Express Co., Inc., know they can trust their safe, reliable performance. Their own maintenance records prove beyond any doubt that the Wagner Rotary Air Compressor, standard on all Wagner Air Brake Systems, lasts longer, operates better, requires less repair and assures an ample supply of air pressure while in operation to meet any road stopping emergency. Every Wagner Rotary Air Compressor has these unexcelled, superior features:

- **Rotary motion to reduce friction loss**
- **Maintains uniform torque load**
- **Assures fast air recovery**
- **Compact installation**
- **Reduces carbon and sludge formation**
- **Easy, infrequent preventive maintenance**

Another dependable member of the family of Wagner Air is the Wagner Relay-Quick Release-Emergency Valve for greater trailer breakaway protection. This emergency unit automatically applies trailer brakes if there is an abnormal drop in the pressure maintained in the trailer emergency line.

Don't delay—now is the time to investigate the many advantages of installing Wagner Air Brakes on the vehicles you manufacture. They are available in straight air or air-over-hydraulic systems. For complete information, contact the nearest of our 25 Branches—or write us direct.

Wagner Air Brake Users are our Biggest Boosters.

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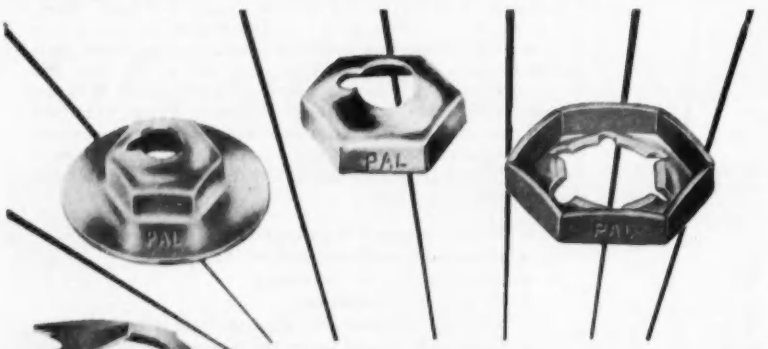
K54-9A

penditures by companies engaged in trade, service, finance, communication and construction.

Business as a whole continued to reduce its inventories through April. In fact, the decline during that month was the largest for any month of the current movement except November of last year. Total holdings at the end of April are estimated at $79.6 billion, marking an aggregate reduction of $2.4 billion from the peak figure of last September. The April decline was entirely accounted for by manufacturers' inventories and centered mainly in durable goods.

Sales Increase

The inventory reduction was accompanied by increases in sales and new orders. (All these inventory, sales and order figures are on a seasonally adjusted basis.) The gain in sales was the second successive monthly increase, and the rise in new orders was the third. About two-thirds of the gain in sales was in nondurable goods, with the food, apparel and chemical industries scoring the largest increases. Among the durables, the widest gains were reported in sales of motor vehicles and primary metals. New orders for durable goods fell slightly below the March level. In nondurables, new orders almost equaled the corresponding 1953 figure, with most of the gain reported by industries without unfilled orders, such as food, beverage, tobacco, apparel, chemical, petroleum and rubber processors and mfrs.



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moulding strips • ornaments • nameplates • medallions • instrument assemblies • glove compartment • light sheet metal assemblies • connecting rods • main bearings • engine mountings • shock absorber mountings • body hold down • brake parts • transmission housing • exhaust manifolds • spring and chassis mounts, etc.

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BOOKS . . .

ELEMENTS OF MECHANISM, *by Venton L. Doughtie and Walter H. James, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $6.00.* Like its predecessor volumes, the book is designed to fulfill two major purposes: to acquaint the reader with the application of fundamental principles of physics and simple mathematics in the field of mechanical movement; and to develop in the reader, through the study of the more fundamental machine elements and analyses of their motions combined in certain ways, the habits of thought and the powers of visualization necessary in the analysis of any mechanical device, no matter how complicated. Each subject is developed with as little reference as possible to other material. Thus, the book can be used to obtain a working knowledge of the entire subject or as a reference on slightly more advanced topics, such as the centro methods for obtaining velocities, Coriolí's law, Klein's construction, and miscellaneous machinisms.

DETERMINING THE BUSINESS OUTLOOK, *edited by Herbert V. Prochnow, published by Harper & Bros., 49 E. 33rd St., New York 16, N. Y. Price, $6.50.* This book provides a complete and authoritative guide to answer the question that is a first concern of the executive and investor: "What is ahead for business?" Twenty of the nation's foremost economists and research experts have collaborated to show how business forecasting can be most accurately done. After a preliminary discussion of the nature of the problem and the short-and-long-term fluctuations that are characteristic of our economy, the book describes how money supply, bonds, stocks, and interest rates, savings, gross national product, and national and personal income are to be interpreted as indices to business prospects. It further analyses the various important lines of economic activity—such as construction, transportation, retail and wholesale trade, agriculture, and population shifts—to explain their influence on the trend of the economy.

THE ECONOMIC ALMANAC (1953-1954), *edited by Frederick W. Jones, published by Thomas Y. Crowell, Co., 423 Fourth Ave., New York 16, N. Y. Price, $3.95.* For many years the National Industrial Conference Board has been issuing this book to its members. Now, for the first time it is being offered to the general public. The book provides accurate information on such topics as population trends, wholesale prices, and stock and commodity costs.

"Dependable performance...matchless service —that's why our pressroom is 96% BLISS"

says Ben Suckle, President of Suckle Electronics Co., one of the largest custom sheet metal fabricators for the electronics industry.

The tail wags the dog in this modern-day Horatio Alger story:

Back in 1946, Suckle Electronics Company, a consulting firm specializing in radio and television engineering, decided to broaden the base of its business by entering the contract stamping business in a limited way.

The sky, though, turned out to be the limit. For today, a scant seven years later, Suckle Electronics Company is one of the largest custom sheet metal fabricators supplying the electronics industry.

"In our first year," says Ben Suckle, "a lack of capital forced us to build up our pressroom with second-hand equipment. We realized, however, that to meet the quick delivery demands of the electronics industry a dependable pressroom is a must. In 1948, we ordered our first new press—a Bliss. We quickly added more, and now there are 40. We standardized on Bliss because our experience proved that the Bliss presses can take our 96-hour-a-week operation, since Bliss replacement parts are truly interchangeable without machining or hand-fitting, and because engineering and other services offered by Bliss are eminently satisfactory."

If, like Suckle Electronics, you're looking for dependability in your pressroom, call a Bliss engineer. He will be glad to help you pick the proper press for your operation.

BLISS
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on your press is more than a name...it's a *guarantee*

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PRESSES, ROLLING MILLS, SPECIAL MACHINERY

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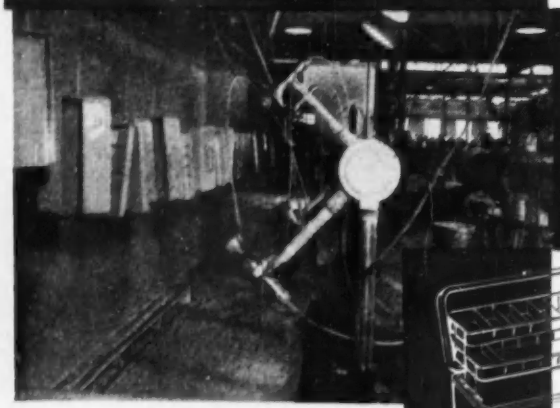
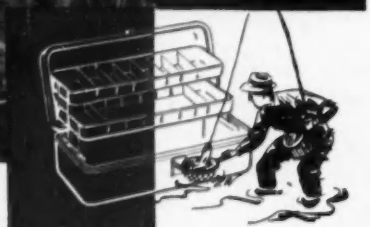
U. S. Plants in Canton, Salem and Toledo, Ohio; Hastings, Michigan; and San Jose, Calif. *Branch Offices* in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. *West Coast Representatives:* Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. *Other representatives throughout the world.*

World's Largest Manufacturer of Tackle Boxes and Minnow Buckets uses the World's Finest Electrostatic Paint Spray



THE RANSBURG NO. 2 PROCESS



Four 3" Atomizing heads are used in the Ransburg No. 2 unit to paint fishing tackle boxes in the Stratton & Terstegge plant in Louisville, Kentucky.

● Stratton & Terstegge Co., Inc., in Louisville, is the world's largest producer of fishing tackle boxes and minnow buckets. Their products—in a variety of styles and finishes—are sold under the trade names of "My Buddy" and "Falls City."

Originally, the company hand sprayed both exteriors and interiors of the tackle boxes. Then, in 1947 efficiency was stepped up when they installed a Ransburg No. 1 Process to coat the box exteriors.

Now, Stratton & Terstegge uses the Ransburg No. 2 Electrostatic Paint Spray which enables them to achieve even further efficiency. Paint savings amounts to 25%, and production is increased 10% with the Ransburg No. 2 over the No. 1 Process! Rejects are practically nil . . . quality of the work is improved . . . clean up time and maintenance is cut to a minimum . . . there's no compressed air to worry about, for the paint particles are electrostatically atomized with the Ransburg No. 2.

Although labor and material costs have increased substantially the past two years, the improved and more efficient plant operations have enabled this company to continue to produce their products at NO increase in price to the ultimate consumer.

Want to know how the Ransburg No. 2 can help cut costs in your painting department and still provide a higher quality and more uniform finish? Write for our brochure which shows numerous on-the-job examples of the Ransburg No. 2 Process.

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana

RANSBURG

BOOKS . . .

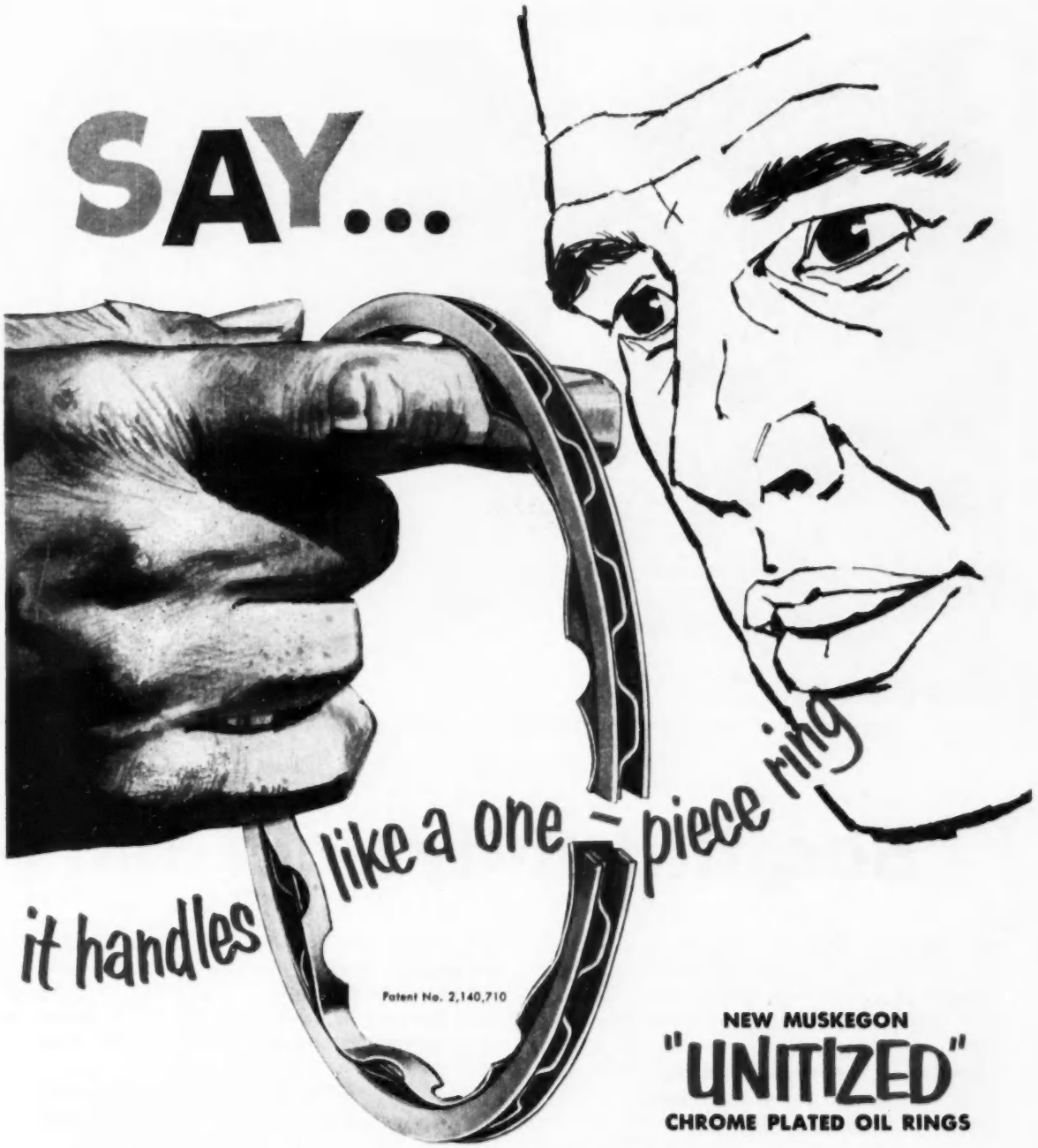
MATERIALS AND PROCESSES, *by James F. Young, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $8.50.* The second edition of this work provides, in one volume, interrelated information needed to apply the engineering fundamentals of materials and processes to the design, production, and control of products. The engineering viewpoint is rigorously applied to the important fields of metallic and non-metallic materials and manufacturing process.

MACHINERY'S HANDBOOK, *by Erik Oberg and F. D. Jones, published by the Industrial Press, 148 Lafayette St., New York 13, N. Y. Price, $9.00.* This standard reference work for the mechanical industries makes available in ready-to-use form the new and hard-to-get as well as the established standard data and information needed by machine designers, mechanical engineers, tool designers, shop management, skilled mechanics, engineering students, and students in shop training courses. It is an invaluable aid and working tool wherever anything mechanical is designed or constructed. The latest edition contains 1911 pages of mechanical tables, rules, formulas, and general data.

AMERICAN INCOME AND ITS USE, *by Elizabeth E. Hoyt, Margaret G. Reid, Joseph L. McConnell, Janet M. Hooks, and Walter G. Mueller, published by Harper & Bros., 49 E. 33rd St., New York 16, N. Y. Price, $4.00.* This fourth volume of the "Series on the Ethics and Economics of Society" focuses on the dramatic rise of American income in the past two generations. The authors point out that this rise has been far more rapid than the development of ethical concepts about its use. The present-day situation is here illustrated by case studies of changes in the character of the American family in general and one family in particular. Emphasizing that abundance alone does not provide a sound foundation for security and development, the book examines the responsibilities of the individual—and of his government which controls such a large share of the national income—and indicates the need for reshaping fundamental policies on the use of our income both at home and abroad.

FACTS ABOUT STAMPINGS, *published by Pressed Metal Institute, 2860 E. 130th St., Cleveland 20, O. Price, $0.50.* This booklet is offered as an aid to those who are faced with problems in the designing and redesigning of parts for metal stamping products. Included in the subjects covered in the book are: holes, flanges, flanges and radii, layout, notches and slots, gage inspection, tolerances, steel gages, dimensions, checklist for prints, press section, definitions, and suggested terms and conditions of sale for the industry.

U. S. GOVERNMENT PURCHASING DIRECTORY, *published by Small Business Administration, copies available from Superintendent of Documents, Washington 25, D. C. Price, $0.50.* Said to be the first complete guide to military and civilian purchasing activities of the Federal Government, the directory lists some 4000 classes of commodities covering the more than 5,000,000 items purchased by both military and civilian agencies of the U. S. Government. It makes it easy for the businessman to learn who in the Federal Government, biggest buyer in the world, buys what and where.



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"UNITIZED"

CHROME PLATED OIL RINGS

"A great idea!" "Why wasn't it done before?"

That's what you'll hear when the assembly-line talk gets around to Muskegon's amazingly different "Unitized" ring . . . the multiple-piece ring that *handles* like a one-piece ring. And no wonder, for look at all the advantages you get. Installation is fast, easy and accurate. There's no fumbling, no chance for error. And when the engine is run, hot oil dissolves the special adhesive—ring components separate and run free.

But there's more to the "Unitized" story. Rails are *chrome plated* to reduce ring and bore wear, scuffing and friction—keep engine performance like-new, oil economy high . . . yet the cost of Muskegon's "Unitized" ring is just *half* that of chrome-plated cast iron oil rings.

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Since 1921... The engine builders' source!

For dependable oil, fuel and hydraulic brake lines in your trucks, trailers,

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What do you need in your tubing?
Should it be leakproof, lightweight? Should it have high bursting point, high fatigue limit? Should it take almost every fabrication operation in the book?

What do you want from your tubing?
Want more peace of mind for yourself and everyone else connected with the production, sale, or servicing of your product? More peace of mind and satisfaction for your customers? Want tubing proved dependable in over 20 years of use in brake lines, fuel lines, hydraulic window lift lines, power-steering-connecting lines, instrument gauges, other applications?

Want your tubing in easily handled straight lengths—clean and ready for your production lines?

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness,

and passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

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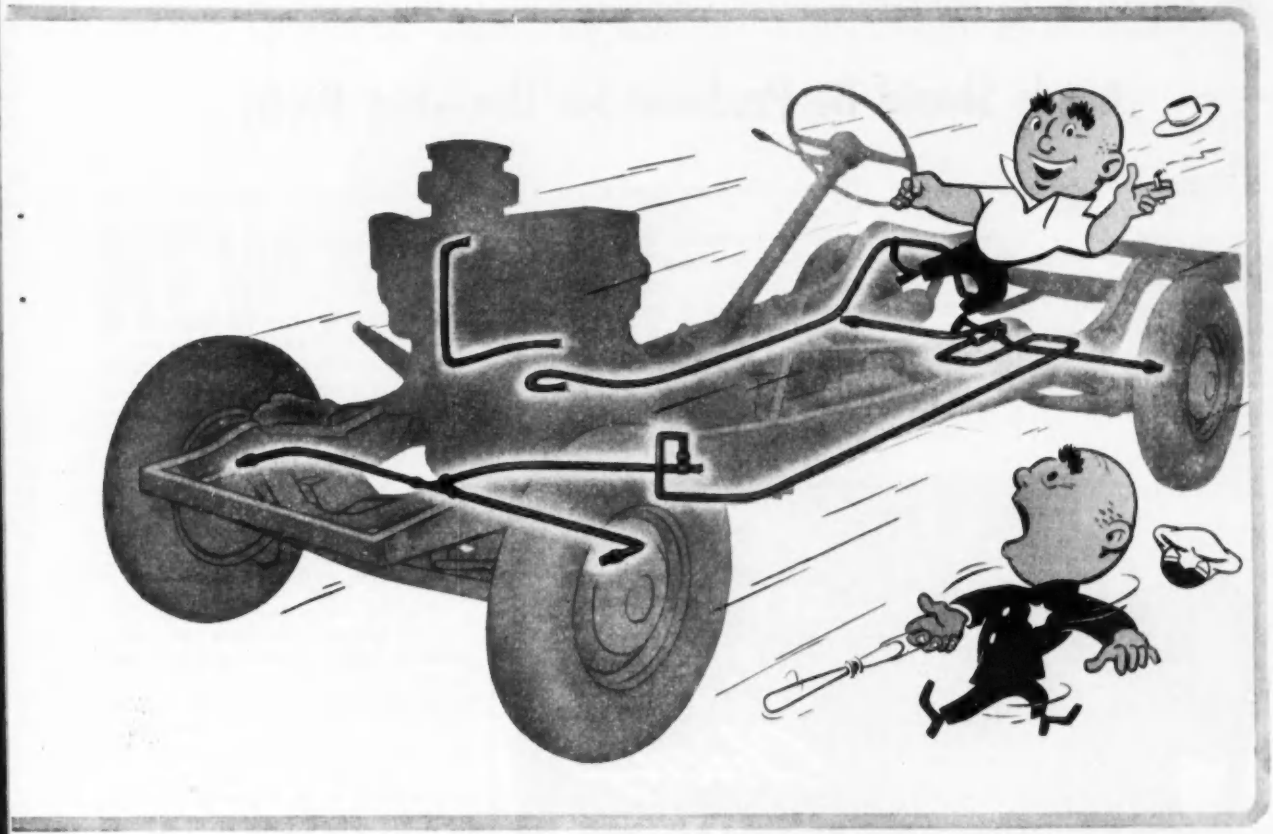
Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.



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your kind of tubing

Or would you like it fabricated into the needed parts—exactly to your specifications? Want deliveries timed to exacting schedules and made as promised? Would you like to call in tubing specialists to work with you on design, fabrication, or function problems?

You'll find that Bundyweld Steel Tubing is your kind of tubing—the *only* tubing double-walled from a single strip, copper-bonded throughout 360° of double-wall contact. And you'll find that Bundy engineering and fabrication services are right to your liking, too. Call, wire or write us today for any details you'd like or for an appointment with a Bundy sales engineer for an exploratory talk.

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DETROIT 14, MICHIGAN

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

An Answer To An Old Fallacy—

Goods Should Be Produced for Use—Not Profit

ECONOMIC clichés are long-lived. Some of the oldest still have surprising vigor. Among the most persistent is the time-worn dictum that goods should be produced for "use," not for sale at a profit. This statement appears among readers' comments on a recent issue of the *Survey* published by Guaranty Trust Co. of New York.

Like most popular sayings, this one has a certain superficial plausibility. Basically, the only valid reason for producing things is that they may be used to satisfy human needs and desires. It is natural enough to inquire, why complicate an essentially simple process by interposing an elaborate price and profit system between producer and consumer?

This question has been asked by many critics of private enterprise, including some who have been known as economists. Failure to understand the answer is widespread, and is responsible not only for much of the popular allure that socialism has but also, more important, for the almost universal tendency of governments to practice price-fixing and other forms of interference with free markets.

Do Profits Reduce Consumption?

Criticism of production for sale at a profit seems to rest upon two main grounds. One of these is the idea that profits reduce the consumption of goods by the people. The other is the notion that goods produced for sale are less useful than they would be if produced for "use." Both of these beliefs arise from failure to understand how the price and profit system works.

In what sense, if any, is it true that profits reduce the consumption of goods by the people? Obviously, it is not true of profits that are distributed to owners and spent by them for consumption. It can be true only of profits that are saved, either by the individual owners or by the enterprises that have earned them.

Profits, however, are not the only form of income that is saved. Wage and salary earners and receivers of interest and rent also save portions of their incomes. These savings reduce current consumption as truly as do saved profits. It is not profits but *savings* that reduce the amount of income available for current personal consumption.

It is probably true that profits are saved to a greater extent than are personal incomes as a whole. Certainly corporations "plow back" a larger proportion of their income, on the average, than do individuals. The same may well be true of unincorporated businesses, although authoritative figures are lacking. It is also generally believed that corporate stockholders save larger shares of their incomes than do most other individuals, though this likewise would be difficult to prove statistically. In any case, the fact remains that it is

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With every press on foot pedal Model 214 Chicago Double Rivet Setter automatically feeds, inserts and clinches *two* rivets. 14-inch throat accommodates large assemblies. Handles 9/64" diameter or smaller steel tubular rivets—lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to versatility. For help with fastening problem...send sample assembly (or a blue print) for free fastening analysis.

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...it's NEW Oakite Composition No. 161 specially designed for washing aluminum

Long-lasting and safe
...good for steel, other metals

Here's your best answer for curbing foam in your power washers. Oakite Composition No. 161, specially designed for washing aluminum, removes all oils, identification inks, ordinary shop soils with great speed and efficiency. *Yet Oakite Composition No. 161 will not foam even when used at high pressures.*

Oakite Composition No. 161 is a SAFE cleaner. It's scientifically inhibited against attack on aluminum surfaces. It dissolves readily. Rinses freely.

Oakite Composition No. 161 is also highly recommended for cleaning steel and other metals in high pressure spray-washing machines.

Try Oakite Composition No. 161 for improving metal-finishing results, fewer rejects, lower production costs. Complete details gladly mailed free on request. Ask for Special Service Report—B3201. Oakite Products, Inc., 28A Rector Street, New York 6, N. Y.

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- Safer Handling

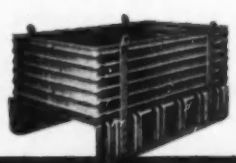
THERE *is a big difference* in Skid Boxes! And Union Metal units offer these unmatched advantages:

1. Box construction, which includes ¾" inside corner radii, 1" triangle bead top flange and half round corrugations on 3" centers, provides *additional strength and increased volume.*

2. All "UNION METAL" Skid Platforms are constructed with double corrugations on 9" centers. Each double corrugation consists of two recessed corrugations, joined by a raised center rib which serves as an integral knee brace. This stronger construction permits heavier loads, and provides more protection against power truck abuse.

3. All units can be equipped with tiering brackets which work in conjunction with the 1" flat triangle bead top flange to provide the utmost security for safe tiering.

4. All parts extending above the top of the box are tumbled to remove *all* sharp edges.



For full information on the most complete line of all steel, corrugated Skids, Boxes, Skid Boxes, Pallets, etc., write to The Union Metal Manufacturing Company, Canton 5, Ohio, and request *your* copy of Catalog No. 77 and Folder No. MH-811.

UNION METAL
Material Handling Equipment

savings, not profits as such, that reduce current consumption.

Savings Are Spent

The next fallacy is the confusion between consumption and demand. Savings reduce current consumption, but it does not follow that they reduce current demand. When earnings are saved and invested in new stores, factories and machines, the demand for these things is as real as is the demand for food, clothing and other goods and services for personal consumption.

Last year less than 63 per cent of the total amount of goods and services produced in the United States was consumed by individuals, according to preliminary Government estimates. This does not mean that the other 37 per cent was not taken off the market. Federal, State and local governments purchased more than 23 per cent, while the remainder, slightly less than 15 per cent, consisted of new construction (a little less than 7 per cent), purchases of new productive equipment by business concerns (a little more than 7 per cent), and additions to business inventories (about 0.7 per cent).

The present-day tendency to condemn saving as bad citizenship is surprisingly widespread. Actually, saving is indispensable to economic progress. More efficient methods of production require more investment in capital equipment, and this investment can take place only as fast as goods are diverted from current consumption to future production. If the entire product of industry were currently consumed, the people's standard of living could never rise appreciably, even if the population should remain stationary. A growing population could be supported only at a progressively lower standard of living.

Savings, then, whether they come from profits or from other forms of income, do not result in a surplus of output over demand. They do reduce current consumption, but only in order to increase future consumption. This elementary rule has long been recognized and practiced by individuals in managing their own affairs. It will be an evil day when the people allow themselves to be persuaded that it is false for society as a whole.

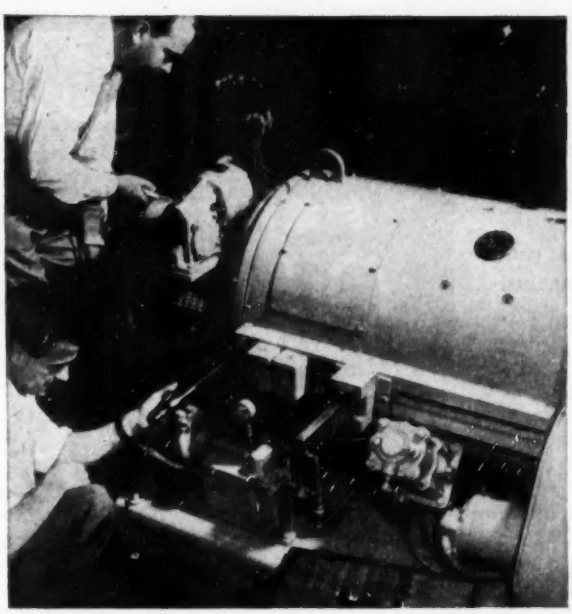
Pleasing the Customer

The other idea underlying the criticism of production for sale at a profit is that things so produced are less good, less cheap, less abundant, or less adapted to human needs than

(*Turn to page* 155, *please*)

ACCURATE TEST RESULTS are obtained on this transmission test stand at Ford Motor Co. Dynamometer Laboratory. D-c dynamometer (rear) is used for driving transmissions and inductor-type dynamometer (foreground) for power absorption.

G-E dynamometer systems help answer tomorrow's automotive test problems



G-E ENGINEERING ASSISTANCE helps insure efficient operation of test system. Here, Ford Motor Co. dynamometer specialist and G-E service engineer check new dynamometer installation.

Close laboratory analysis of experimental truck and automobile road performance with G-E dynamometer systems is now routine in almost every automotive test center in the world. To make sure these dynamometer systems will answer new, intricate test problems, G-E specialists work closely with the automotive industry in a continuing program for system improvement. The results have been the development of G-E dynamometers that match and anticipate advances in engine design, the demand for higher speeds and lower system error.

General Electric's specialists help you get exactly the right dynamometer for your specific testing requirements. They analyze your application needs, help you set up a dynamometer program, and assist you in actually solving torque measurement problems. This G-E engineering assistance helps assure you of smooth, efficient operation of your dynamometer system.

For more information contact your nearest G-E Apparatus Sales representative, or write for Bulletin GEA-5923, Section 651-5, General Electric Company, Schenectady 5, N. Y.

Engineered Electrical Systems for the Automotive Industry

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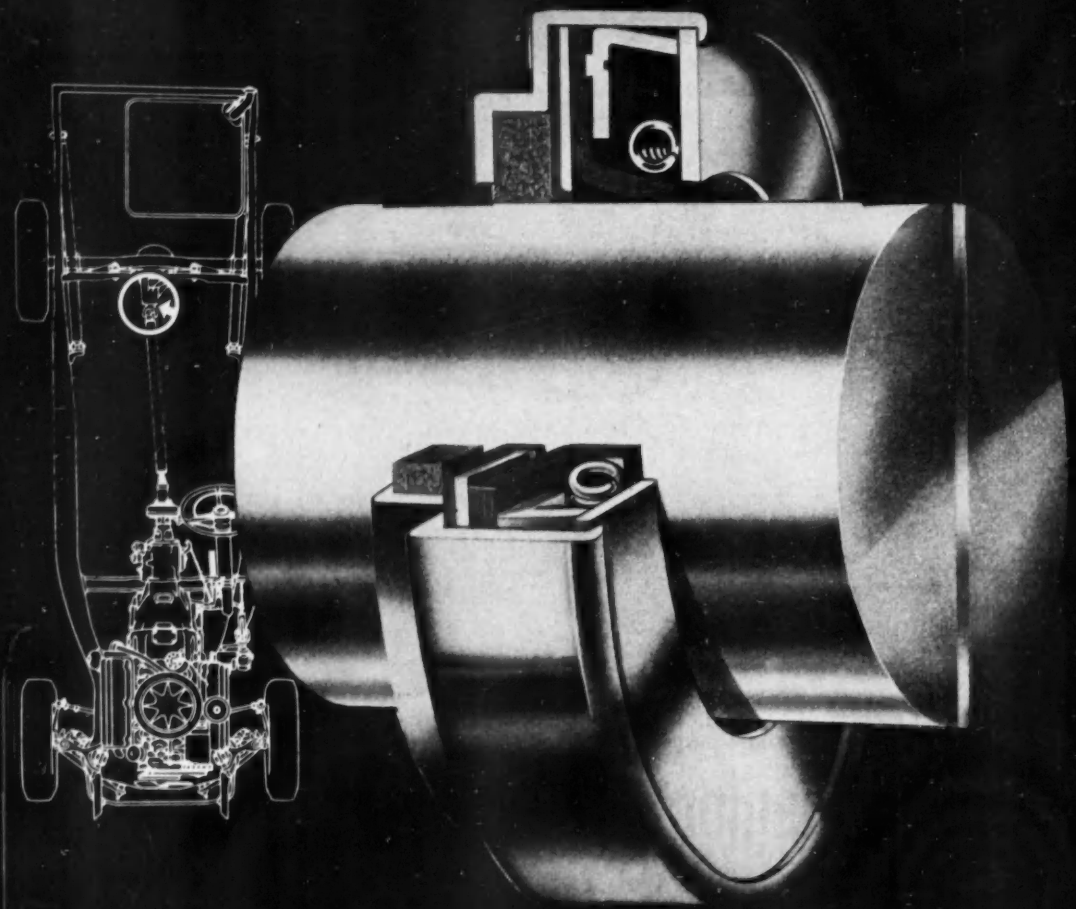

TAKES THE HEAT OFF TOUGH JOBS Operating temperatures were lowered significantly, with resultant savings in power and increased service life when a C/R oil seal with a **Conpor** leather sealing element was used as the pinion shaft seal in one of the current fine automobiles. Whether your sealing problem is for a severe or simple application . . . whether it calls for leather with controlled porosity, or specially compounded elastomers, discuss it with C/R engineers. They will gladly cooperate on special designs or help you choose from 17 standard types and 1800 sizes. Write for your copy of "Engineering with C/R Oil Seals."

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(*Continued from page* 152)

they would be if price and profit did not enter into the picture. It is impossible to tie this notion down to any one fallacy. It is the product of a whole set of fallacies, which add up to a simple failure to understand what prices and profits are for and how they work.

"Made to sell" is a term of disparagement often applied to an article that has been found unsatisfactory. It implies that the producer was interested only in selling the article, not in pleasing the buyer. To anyone who gives the matter a little thought, it must be evident that a businessman of normal intelligence who hopes to be in business next year does not aim at that objective by cheating this year's customers. Of course, there are "fly-by-night" concerns organized to reap quick, fraudulent profits before going out of business. Such concerns, fortunately, do not bulk large in the general business picture, and it is not difficult for sensible buyers to avoid their wares. To judge business in general by such standards is as unrealistic as to judge the human race by the one in a million who is a professional safecracker. If there is one instrument of business policy that stands out above all others in the operations of reputable concerns, it is that of pleasing the customer—of giving him what he wants, in as much abundance as he will take, in the best quality consistent with the price, and at a price that will keep him coming back.

In this unceasing endeavor, American business spends hundreds of millions of dollars every year in the search for new products, higher quality, and lower costs of production. Business does not do this because of philanthropic concern for customers' welfare. Businessmen are neither more nor less altruistic by nature than are customers themselves. As businessmen, their job is to stay in business and earn profits. And they know that they can do this only by keeping abreast of their competitors in the stiff contest for customers' favor.

Just as the incentive that impels businessmen to meet customers' needs and desires is profit, so the means by which these needs and desires are expressed is price. Money is the only available common denominator of usefulness, applicable to the whole range of goods and services bought and sold in the market place. The buying public, by paying certain prices for certain quantities of certain products, registers a perpetual vote in favor of that particular way of employing

(*Turn to page* 158, *please*)

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FAIRFIELD
● If Gears are a part of the machines you make, there is no finer recommendation for YOUR PRODUCT than to be able to say it is "Equipped with FAIRFIELD GEARS!"
By specializing exclusively in *Fine Gears Made to Order* for thirty-five years, Fairfield has become one of America's largest producers of these parts. Fairfield's facilities are unexcelled. Here "under one roof" in a new and ultra-modern plant designed especially for the purpose, Fairfield has everything needed to produce your gears EFFICIENTLY, ECONOMICALLY. *Call or write for information TODAY.*
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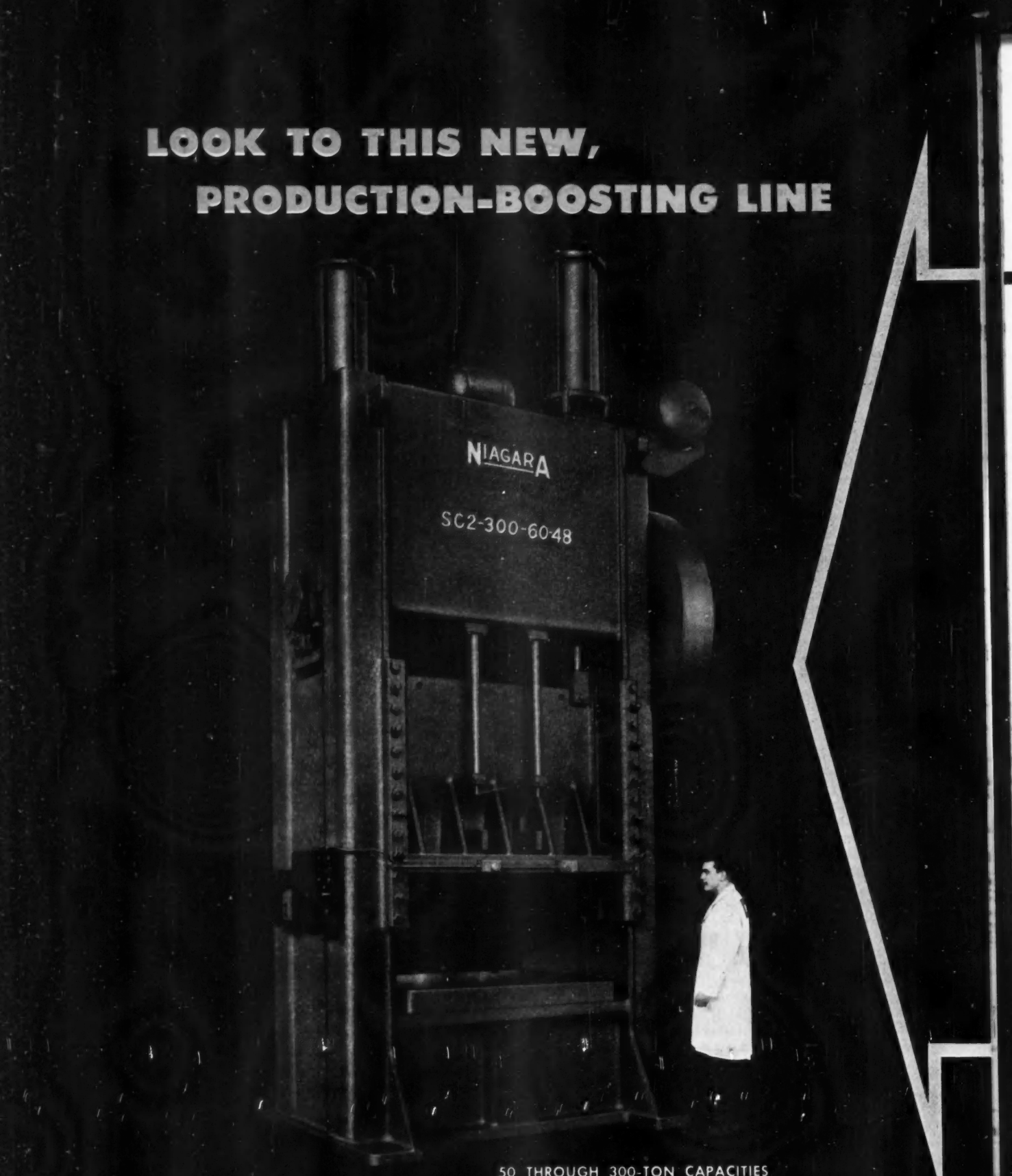
LOOK TO THIS NEW, PRODUCTION-BOOSTING LINE



50 THROUGH 300-TON CAPACITIES

NIAGARA MACHINE & TOOL WORKS 1879 75 1954

America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

For a realistic answer to the metal stamping and forming problems of today... and tomorrow

DESIGN MODERNIZATION CONCEALS DRIVING MECHANISM

Fully streamlined, enclosed construction, front and back, provides pronounced advantages. There are no exposed, overhanging flywheel, clutch, brake, intermediate shaft, nor motor in rear of press to obstruct crane service, block light, throw grease and consume floor space unnecessarily ... yet all parts are quickly accessible.

WORK-SAVING FLEXIBILITY MEETS SHIFTING PRODUCTION NEEDS

Box type welded steel slides are power adjusted through self-locking, worm driven, barrel type connections to accommodate a wide range of die heights and to permit quicker, easier and safer die setting. Niagara electric clutch control provides trouble-free push button operation and a five-position selector switch for ease, safety and efficiency in single stroking, continuous running, jogging, reverse jogging and slide adjustment.

RUGGED, HEAVY DUTY FRAMES PROLONG DIE LIFE

All-steel, rigidly constructed frames, featuring an exclusive triple box section design, provide maximum resistance to deflection from horizontal, diagonal and torsional stresses. Greater accuracy and longer die life are thereby assured.

GREAT SHUT HEIGHT AND LONG SLIDE ADJUSTMENT

Unusually liberal shut height and extremely long slide adjustment, of both one and four-piece frame construction, permit use of a tremendous range of stamping and forming dies.

Hailed as the most progressive step in straight side, double crank press history, the new Niagara SC-2 Press Series could only have originated from a keen insight of today's metal working problems and the more challenging ones of tomorrow. In every detail of design, you'll recognize the unduplicated competence of Niagara engineers. Who else would be more mindful of press users' needs than the men who design and build America's leading and most complete line of presses, press brakes, shears, other machines and tools for plate and sheet metal work?

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Preview this complete new line of straight side presses at once. Find out what they can do for you. Write for Niagara's new, illustrated Bulletin 64-H today.

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NIAGARA

STRAIGHT SIDE DOUBLE CRANK PRESSES

(*Continued from page* 155)

society's stock of human and material resources.

The Democracy of Free Markets

A free-market economy is the most perfect possible example of rule by the will of the people. Political democracy has nothing to approximate it. In a political democracy the people vote periodically or occasionally for and against a few candidates or issues at a time. In a free-market economy they vote constantly for and against thousands of competing goods and services. Their votes, instead of being merely affirmative or negative, express minute gradations of preference, and these gradations shift not only daily but hourly.

Advocates of production for "use" seem to think that the decisions of bureaucrats would come closer to expressing the people's will in economic matters than do the votes actually cast by the people in the form of price offers. An army of bureaucrats, completely dedicated to what they believed to be the people's will, swayed by no consideration of personal advantage or favoritism, and endowed with as much intelligence and ability as are granted to human creatures, could not even remotely approach the exactness with which the bewildering complex of popular wants and preferences is expressed by the people themselves in their buying practices, and is served by business concerns competing for the consumer's dollar.

Indignation is sometimes voiced at the fact that the output of each commodity and service is limited to the amount that can be sold at a profit, when it is evident that the people's wants are far from being completely satisfied. Those who take this attitude forget that it is not in the order of nature that people's wants ever should be completely satisfied under any conceivable system of production. The productivity of industry is large and increasing, but it is not and can never be unlimited. A consumer can enjoy one satisfaction only by foregoing others. Wants must be satisfied in the order of their urgency, with due regard to the relative costs of satisfying them. When the relative cost of the satisfaction exceeds the relative urgency of the want, it becomes unprofitable to produce more of the commodity or service in question. This is only another way of saying that, costs being considered, the consumer prefers to spend his money for something else.

Much of the confusion that gives rise to such ideas as that of production for "use" is probably due to the complexities of modern economic society. Viewing these complexities, the observer tends to lose sight of the comparatively simple principles underlying them. He cannot see the forest for the trees. He forgets that the complexities are matters of organizational detail. They are necessary in the interests of efficiency, but they do not essentially alter the fundamental realities of economic life.

Actually, there is no conflict between production for use and production for sale at a profit. The latter *is* production for use. The sale at a profit is only the monetary expression of the relationship between the usefulness of the product and the cost of producing it.

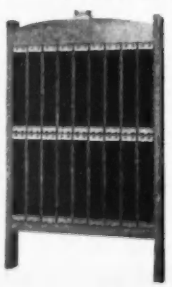
The Effects of Price-Fixing

The same failure to understand the meaning and function of prices and profits in free markets undoubtedly goes far toward explaining the readiness of governments to undertake various forms of price regulation. Arbitrary notions of "fair" prices are tempting. But what prices can be fairer than free prices that express

YA® Radiators

...assure DEPENDABLE POWER on this heavy duty crane and shovel

It takes a rugged crane and shovel to dig rocks in the building of America's turnpikes . . . and equipment such as this demands heavy duty radiator equipment. The machine illustrated is equipped with YA Sectional Cast Tank Radiators that can stand up under continued operation. Being of sectional design, they permit easy replacement of sections right on the job, with a minimum loss of time. Call in a Yates-American representative to work with your engineers in planning the correct radiator equipment to fit your specifications.

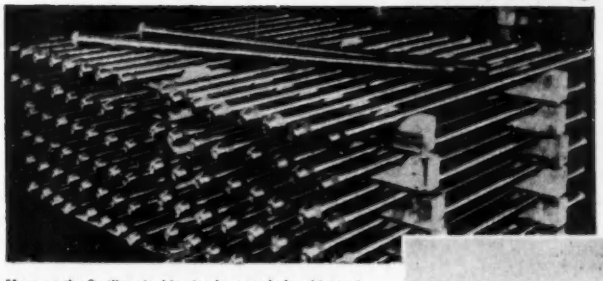


California Representative: E. E. Richter & Son, Emeryville, Calif.

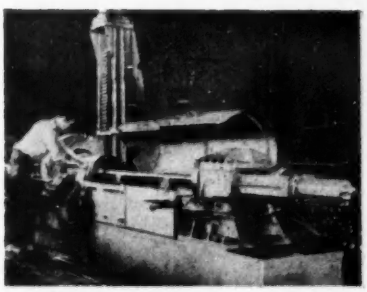
YA® Heat Transfer Products Division

Yates-American

U·S·S Carilloy steel cushions bone-rattling jolts on the world's finest medium tank



Here are the Carilloy steel torsion bars ready for shipment. Torsion bars are used on the Patton 48, and others, so that the tanks can be built closer to the ground, giving a lower silhouette.



On this twister at the Cicero plant of Maremont Automotive Products, Inc., the finished Carilloy steel torsion bars are prestressed before shipment to the tank manufacturer.

THE army's amazing new Patton 48 not only moves faster, shoots straighter, and offers better protection to the tank crew than World War II models, but it has a vastly improved suspension system that features torsion bar springs made of U·S·S CARILLOY steel. As a result, it rides lower, more level, and with less jarring.

During rugged field tests, this 45-50-ton tank rolls along at more than 30 miles an hour, knocks down telephone poles and houses, rumbles over deep trenches and scales 3-foot walls. All the while, the CARILLOY steel torsion bars that support the driving wheels flex, twist, and vibrate. They smoothly absorb most of the jolts.

Torsion bars withstand this heavy pounding . . . and do a better job of cushioning these shocks than previous spring systems. What's more they take less space, so the tank can be built closer to the ground and has a lower silhouette.

U·S·S CARILLOY 8660 is a Ni-Cr-Mo electric furnace steel which possesses the hardenability needed in these torsion bars. It will produce a minimum hardness of 55 Rockwell "C" at 1/16" from the quenched end in the standard End Quench hardenability test. It has exceptionally good surface and sub-surface qualities.

Both the U.S. Army Ordnance Corps and the spring manufacturer, Maremont Automotive Products, Inc., are well satisfied with this excellent performance.

U·S·S CARILLOY steels are doing many tough jobs like this on both military and civilian products. No matter what steel problem you have, we have probably met and licked one like it before. We can help you solve yours. Just contact our nearest District Office, or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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UNITED STATES STEEL

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the real wants of the people and force industry to adjust its operations to those wants? Any form of interference with free markets, whether by private monopoly or political authority, hampers this adjustment. Yet governments impose price ceilings which automatically create shortages of the commodities affected. They apply rent controls and then have to spend large amounts of public money to fill housing shortages which private enterprise cannot fill because building has been rendered unprofitable. They decree price floors which, unless accompanied by effective restrictions on output, bring forth unmanageable surpluses of commodities. They fix arbitrary exchange rates that upset balances of international payments and necessitate rigid trade restrictions. They enforce or encourage wage increases without regard to productivity, which defeat their own purpose by either raising costs of living or making it unprofitable to give full employment to labor.

All these errors could be avoided if it were well enough understood that the price and profit system is not a mere appendage added to the industrial structure for the enrichment of capitalists, but the necessary driver and regulator of productive effort. Almost two centuries ago the peoples of the Western World began casting off the political strait jackets that had been thrown around their economic life. Their rebellion was rewarded by the most phenomenal era of freedom, growth, invention and material progress that the world has known. These things were possible because the dynamic power and the automatic regulatory action of the price and profit system had replaced the awkward and oppressive rule of political overlords—because production for sale at a profit had supplanted porduction for "use."

How many times must the same lesson be learned?

The above article is from the Guaranty Survey.

New Material

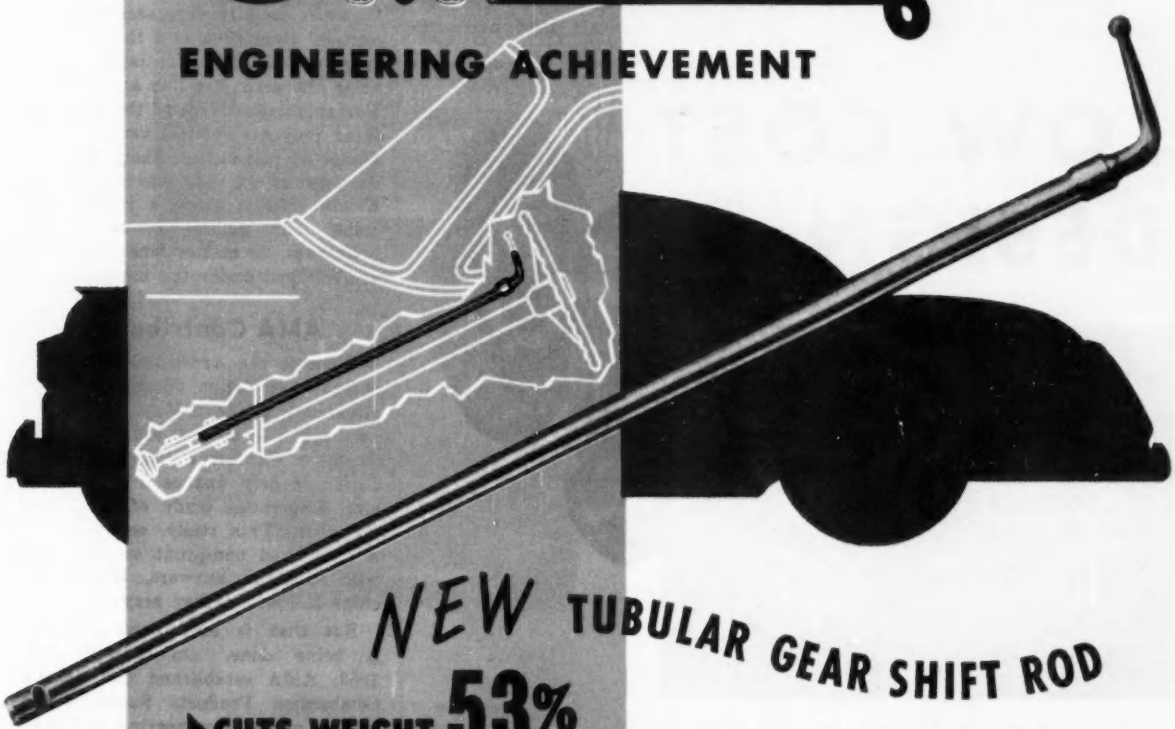
(*Continued from page* 51)

satisfactory. After some experimenting, Ford experts found that admirably satisfactory glued joints could be made by using Ren-Ite cements supplied by Ren-Ite Plastics, Inc.

Manufacturers in the automotive industries are encouraged to contact Mr. Vallier at Ford engineering if interested in this new technique.

Another ROCHESTER PRODUCTS STEEL GM *tubing*

ENGINEERING ACHIEVEMENT



NEW TUBULAR GEAR SHIFT ROD

▶ **CUTS WEIGHT 53%**
...Yet Meets All Durability Requirements
▶ **LOWERS COSTS**

Perhaps you'd never think of building a gear shift rod from *tubing* . . . but Rochester Products did. The result is an ingeniously designed, soundly engineered GM Steel Tubing rod that will stand up under all conditions—yet weighs *less than half* as much as ordinary rods. Best of all, it COSTS LESS!

Here is one more example of how Rochester Products engineers are combining ideas, skill, experience and GM Steel Tubing to help hundreds of industries build *better products* for *less money.* We can help *you,* too!

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Entitled *"Better Products for Greater Progress . . ."* this new, illustrated, fact-packed brochure tells how GM Steel Tubing can help solve design, production and cost problems. Send for your free copy today. Request Brochure No. 1120.

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RP GM STEEL TUBING

Smog and Exhaust Fumes

(*Continued from page* 80)

motorists to invest a sizable amount of money, perhaps $50 per car, for something that may not even be a palliative. To be sure, it does present an attractive one-shot market representing some $100 million expenditure by the public.

Problem Analyzed

Just what is this smog problem? The second technical and administrative report on Air Pollution Control in Los Angeles County (1950-1951) shows it is something caused by the unique topography and meteorology of the region. The bowl-like basin is almost completely surrounded by mountains which prevent natural horizontal ventilation of the basin. The air that normally reaches the California coast, particularly in summer, comes clockwise around a large high pressure area lying over the Pacific with its center north of the Hawaiian Islands. As a column of air moves south-eastward around this high, the upper part sinks and is heated. At the same time, the part next to the surface of the ocean is cooled from below, producing a layer of cold, moist air below the warm, dry descending layer.

This phenomenon is called a temperature inversion because the temperature usually decreases with elevation. Here then is a thick, almost impenetrable "inversion layer" blanketing the area just like an umbrella. For about two-thirds of the year this layer prevents vertical ventilation or escape of pollutants. About 60 to 70 days out of the year this layer hangs within 1000 ft above a region with some four million residents. All pollutants, no matter what they are, are confined under the umbrella.

AMA Contribution

What is the Automobile Manufacturers' Association doing about this situation? Early in May, 1954, AMA awarded a grant of $50,000 to the Southern California Pollution Foundation to help finance a comprehensive, long-range study of urban air pollution. This study, conducted by a recognized non-profit organization, will seek the answers, letting the chips fall where they may.

But that is only part of what is being done. On December 4, 1953, AMA established the Vehicle Combustion Products Subcommittee (VCP) of the Engineering Advisory Committee (EAC) to make a complete study of the problem as it relates to motor vehicles. Shortly thereafter, a group consisting of eight members of VCP, the secretary and a staff representative of the AMA public relations department visited the technical personnel and research facilities in the Los Angeles area from January 25 to February 4, 1954; and San Francisco on February 5.

This was done specifically to make a preliminary study of conditions where they exist. The Detroit group met with technical personnel both of the official air pollution county agency and with those employed by private research groups. A detailed report of findings and conclusions, together with preliminary recommendations was presented in an official report to EAC on March 18, 1954.

(*Turn to page* 166, *please*)

LOW COST DESIGN

Before you approve the blueprint for your next model — double check to make sure it includes the latest improvements you can build into your product with the right type and size ROCKFORD CLUTCH. It will pay you to consult our engineers concerning technical clutch advances that will give you and your customers the advantages of better power transmission control.

Send for This Handy Bulletin

Shows typical installations of ROCKFORD CLUTCHES and POWER-TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

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315 Catherine Street, Rockford, Illinois, U. S. A.

ROCKFORD CLUTCHES

new! Houdaille MAGNETIC SEPARATOR

FOR AUTOMATIC, LOW COST
REMOVAL OF FERROUS METALLIC PARTICLES
FROM COOLANTS AND CUTTING OILS

GRINDERS
MILLING MACHINES
GEAR SHAPERS
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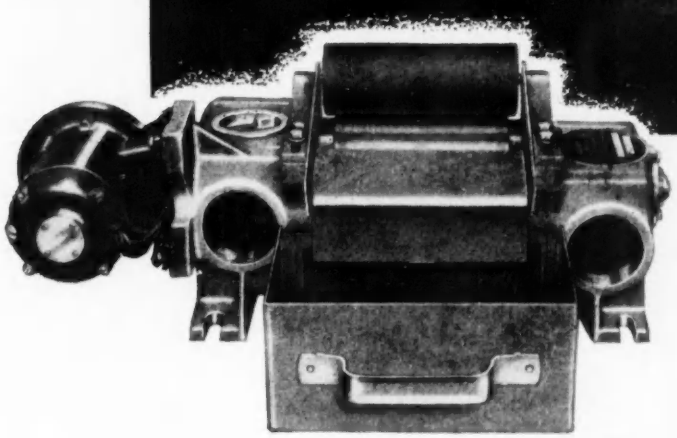
HONING MACHINES
BROACHING MACHINES
and many others



NOW . . . a *completely new* Magnetic Separator designed to remove ferrous metallic particles and sludge from liquid coolants, mineral oils and soluble oil solutions used in all types of ferrous metal finishing operations. Automatic, continuous cleaning of coolants with the Houdaille Magnetic Separator provides:

- **Increased Production**
- **Longer Wheel & Tool Life**
- **Better Finishes with Fewer Rejects**
- **Greater Safe-Use Life of Oil or Coolant**
- **Lower Operating and Maintenance Costs**

IMPORTANT FEATURES:

EASY INSTALLATION ON MACHINE TOOL SUMP

Flexible design permits choice of three inlets and two outlets. Small, compact unit features five ports, drilled and tapped, for easy installation on machine sump . . . needs no extra floor space in most cases.

360° CONSTANT MAGNETIC ATTRACTION

Permanent ring magnets enclosed in revolving cylinder provide 360° of magnetic attraction. Evenly distributed . . . no spottiness. Assures complete removal of ferrous particles from coolant.

ECONOMICAL, TROUBLE-FREE OPERATION

Separator uses 1/70 hp. (4.8 RPM) gear head motor (TENV). Features smooth, automatic operation. Nothing to lubricate, nothing to get out of order. Can be operated in many cases off present 110-volt control circuit.

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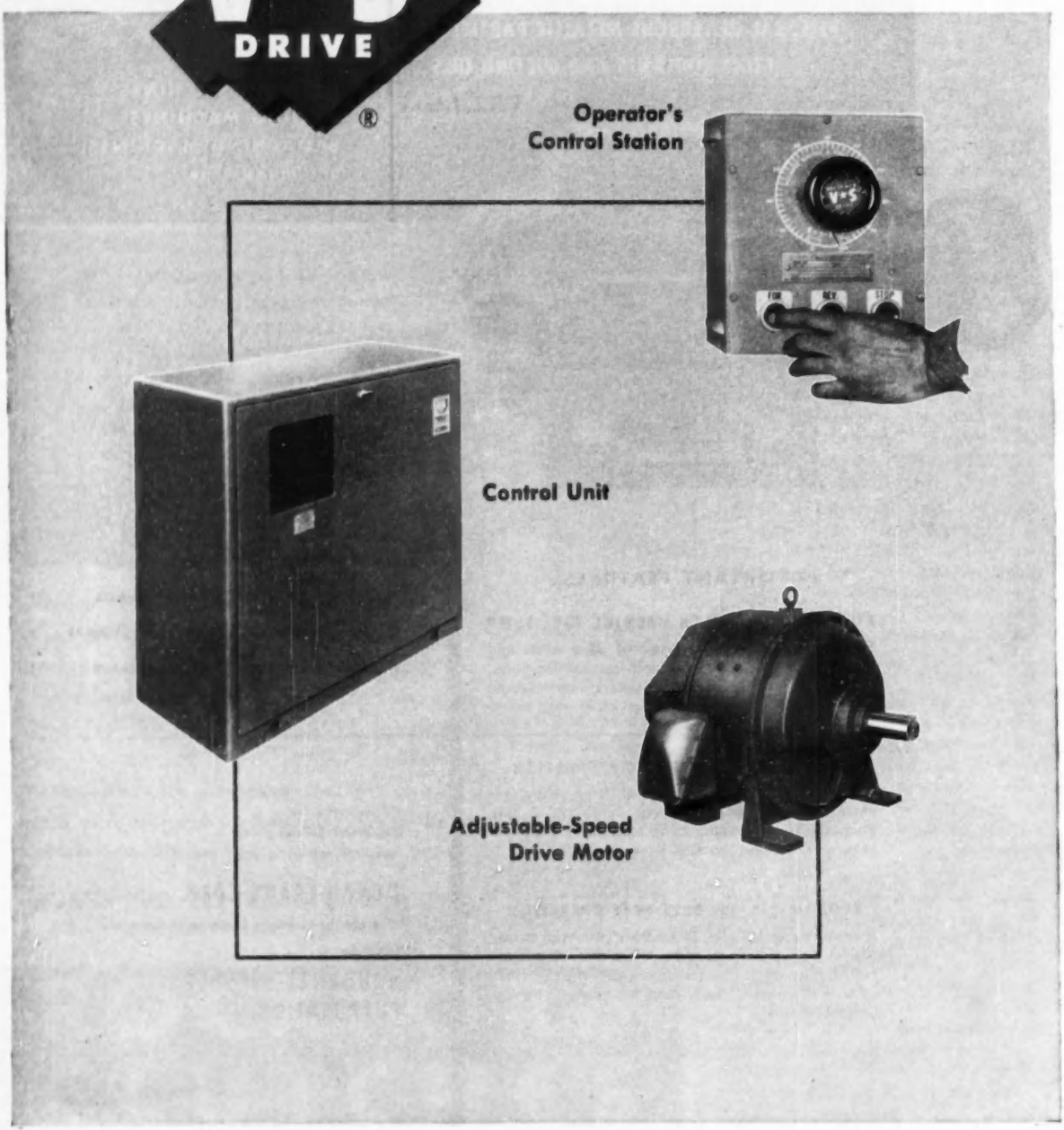

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moving things faster...more accurately!

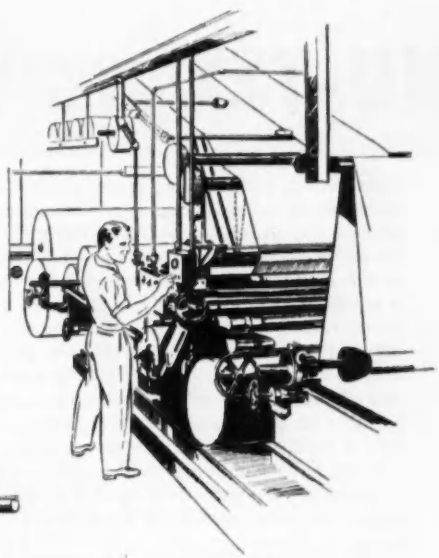
RELIANCE *Precision-Built* MOTORS

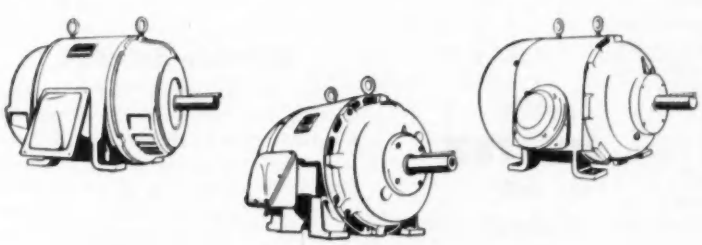
Reliance electric motors, adjustable-speed drives, electronic controls, and applied engineering—the Tools of Automation—make it possible to secure increased production in a single machine . . . part of a process . . . or an entire factory.

And these tools provide all the dependability and economy you need to get complete benefits of automated equipment. They have established an unequaled record of performance under the most exacting operating conditions in industries like textile, chemical, steel, metal working and automotive.

One of the most important Tools of Automation is Reliance Applied Engineering which is used to analyze and supply the answer to your specific situation. Reliance engineering is backed by nearly 50 years of experience in the development and engineering of drive systems which have made automation possible.

For all the facts, write for your copy of our new booklet, "The Tools of Automation". D-1474





RELIANCE ELECTRIC AND ENGINEERING CO.

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Smooth operation:

WELD GRINDING with

NU-TEX DEPRESSED CENTER WHEELS

Undercutting and reducing heavy welds is a smoother, faster, safer operation when you use Nu-Tex Depressed Center Disk Wheels. *Smoother* because Nu-Tex Wheels are designed with a built-in resiliency to reduce bouncing to a minimum, assure a steady, cushion-like grinding action. *Faster* because their cushioned cutting action distributes pressure evenly over grinding areas . . . makes every inch of surface travel an inch of productive cutting, whether you use portable or bench-type grinders. *Safer* because they're bonded together with an extremely tough resin for maximum durability . . . textile-reinforced to assure greater protection against breakage, longer life under continuous operation.

Why don't you investigate the time and money-saving advantages of Nu-Tex Disk Wheels? Straight and depressed center Nu-Tex Wheels are available in all popular diameters and thicknesses for cutting, slotting, roughing, smoothing, grinding or polishing. Grades range from 0 (hard) to 6 (soft). Write now for complete details. Atlantic Abrasive Corp., 526 Pearl St., South Braintree 85, Massachusetts.

Specify **NU-TEX** *for 360° of wheel efficiency!*

ATLANTIC ABRASIVE CORP.

South Braintree 85, Massachusetts

Smog and Fumes

(*Continued from page* 162)

Summary

Briefly, some of the findings may be summarized as follows:

1. There remains lack of conclusive technical data as to what substances are responsible for eye smarting and crop damage.

2. At this writing officials of the LA Air Pollution Control District consider motor vehicle exhaust and refinery processes to be the most significant sources of pollution.

3. Although there has been considerable progress in the control of visible emissions, a lot of research still remains to be done on the role of incinerators and other combustion processes.

4. As nearly as can be determined at this time, there is no device that can be hung on a motor vehicle which can satisfactorily eliminate undesirable exhaust products.

5. Preliminary studies in LA indicate that the use of LPG by trucks and buses does not offer a solution to the overall problem. It does appear to be effective in reducing undesirable smoke and odor in the immediate vicinity of the vehicle.

6. Although the visible emissions from poorly maintained motor vehicles are not considered to be a major pollution factor, there is no question they are resulting in unfavorable public reaction. (We might note, parenthetically, that under the circumstances this is something that should be tackled by dealers and repair shops as a matter of public education.)

Ultimate Solution

The Detroit group found strong sentiment by the community that the ultimate solution to the problem lies in a long-range program of research and development. If this sentiment can be strongly reinforced, it will be decidedly in the public interest and will gain time for organized research to do its job properly.

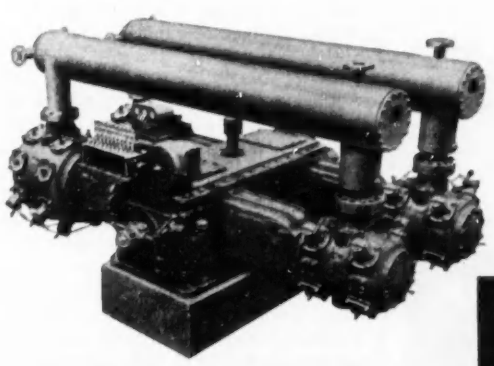
In addition to the $50,000 grant for research work this year by the Foundation, AMA will utilize the services of the Coordinating Research Council (CRC) as well as the laboratories and proving grounds of the automobile industry in a concentrated study of combustion problems and control of exhaust gases. It may be visualized that the marshalling of

Space and location are rarely a problem

One of the biggest factors in determining the location of an air compressor is its foundation requirements. Obviously, the more a compressor vibrates, the heavier the foundation must be.

You won't face such problems with a Clark Balanced/Opposed, Motor Driven Compressor. There are no vibrations . . .

They're all cancelled out!



If you'd like to install a Clark unit on an upper floor that's structurally strong enough to support its weight, *do it* . . . and you won't need much space, either. Its compact design permits installing a large amount of horsepower in a limited floor area . . . and its precision construction means you can practically forget about it once it's in operation.

For complete details on this truly modern air compressor in the 150 to 4500 hp range, write for Bulletin 118 or get the facts first hand from your nearest Clark representative.

CLARK BROS. CO. • OLEAN, N. Y.

Division of Dresser Operations, Inc.

Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON

CLARK balanced/opposed compressors

© 1953, Clark Bros. Co., Division of Dresser Operations, Inc.

these enormous resources implies that the industry will be expending hundreds of thousands of dollars on this problem.

One cannot emphasize too strongly, however, the need for constructive and coordinated effort in getting the story around to the public and Government agencies to prevent hasty or ill-advised action while the wheels of research are turning. No one will know just what is at the root of the problem of smog, nor how the offender can be isolated and controlled until the returns are in.

Largest Die Casting Machine

(*Continued from page* 84)

terms of large aluminum die castings in the forward planning of lightweight product design. Among the typical mass production parts that can be produced are: die cast aluminum cylinder blocks for passenger car and truck engines; rear deck lids; instrument panels; door frames; and other large sections of the body. For example, it is visualized that the entire cowl section could be produced as a one-piece die casting.

Significant too is the estimate that in the larger sizes, aluminum die castings can compete on a price basis with cast iron, with the further possibility that overall costs can be considerably lower since the die castings can be made with precision and thus will require little or no machining in the "as-cast" state.

In 1950 (see AI, December 1, 1950) Doehler-Jarvis was producing the one-piece Packard grille, said to be the largest plated zinc die casting then in production. It was made on one of the largest zinc die casting machines then known to the art—a 48-in. machine. Incidental to this, Doehler-Jarvis had in operation one of the largest automatic electroplating units then in use in the industry.

About a year earlier (see AI, October 15, 1949) the then Kaiser-Frazer Corp. undertook an experimental project with the use of aluminum die-cast inner door frames, made by Doehler-Jarvis. It was purely an experimental venture and did not emerge as a production item. However, it did demonstrate the feasibility of producing such large sections in aluminum and afforded for the first time completely interchangeable door assemblies in combination with a die-cast door frame.

Certainly the fact that such large castings can be made practically and in mass production opens the way to many applications that may have been only a gleam in the designer's eye. Now that a machine capable of producing such parts is an actuality, designers no longer are restricted in action for lack of experimental facilities.

Doehler-Jarvis engineers also point out that large aluminum die castings are particularly favorable to production of parts required in smaller volume where it has been necessary to resort to sand castings or cast iron heretofore as a measure of economy. Consequently, heavy duty parts for trucks and buses such as transmission cases, axle housings, torque converter elements, etc., can be produced with considerable overall cost economy.

Burton . . CARRIES THE LOAD FOR ALLIS-CHALMERS

Burton Leaf Springs, installed by Allis-Chalmers and other manufacturers of heavy-duty, off-highway equipment, are recognized throughout the heavy equipment industry. They are known to be precision made to give maximum service.

Many years of growth with the motor vehicle industry have given Burton positive first-hand experience; a thorough scientific knowledge of industry needs.

Burton engineers are striving constantly to maintain and improve the efficiency of the springs that support the rolling stock of the nation. They will be happy to consult with you concerning your own spring problems.

For prompt, competent action, contact Burton today.

PUT THE BURDEN ON BURT BASCO

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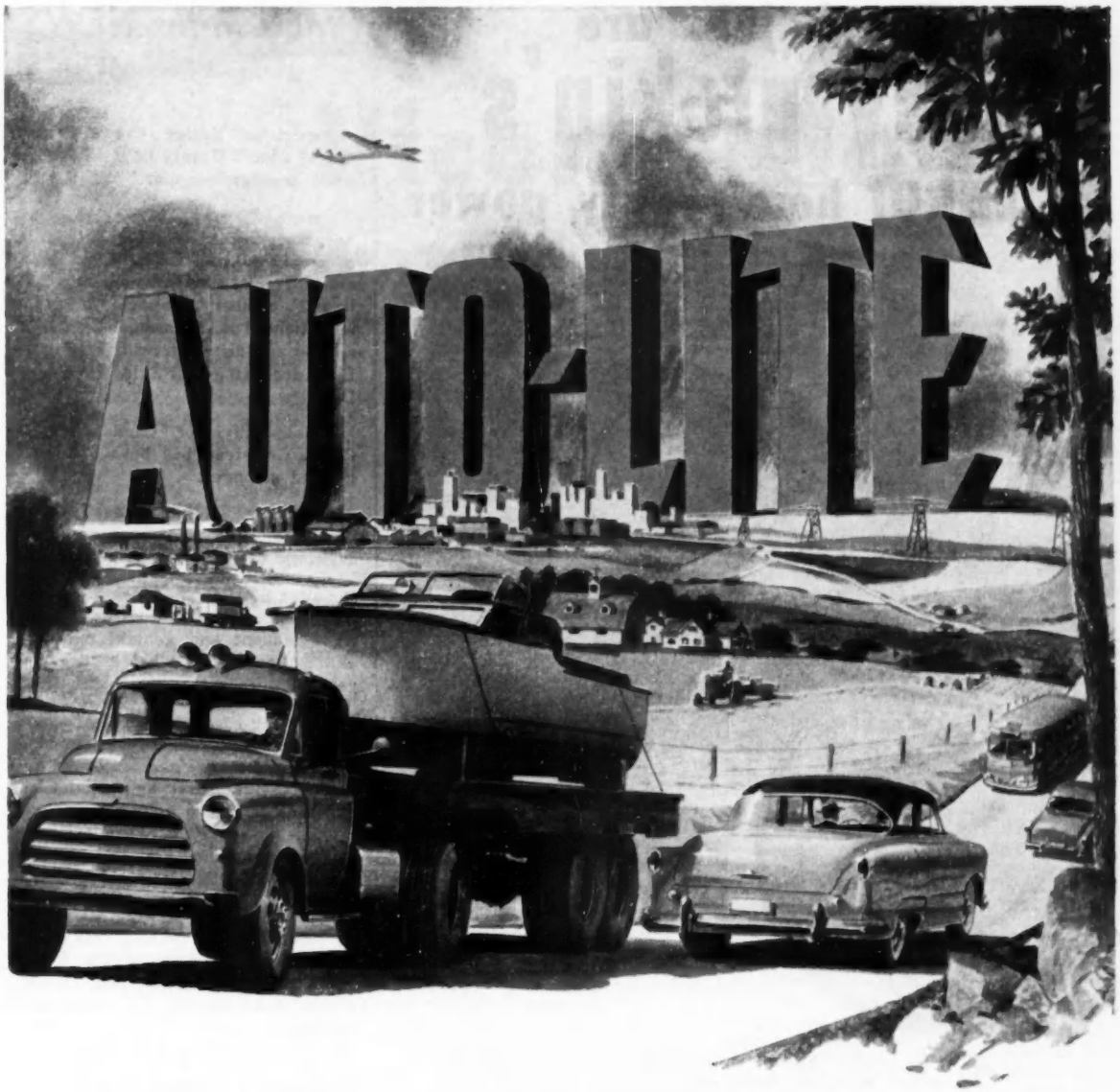
Chicago 32, Illinois



Auto-Lite is world famous for long life, performance and economy

Around the world, more than 400 products of Auto-Lite are used day and night in cars, trucks, planes, boats and industry . . . convincing proof of the outstanding quality made possible by Auto-Lite advanced engineering and precision manufacturing. So to get the best in long life, in power and performance and in economy, it pays to insist on world famous Auto-Lite products.

Manufacturers of

BATTERIES • BUMPERS • FUEL PUMPS • HORNS • GENERATORS • LIGHTING UNITS
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INSTRUMENTS & GAUGES • IGNITION UNITS • MOULDED PLASTICS
WINDSHIELD WIPERS • WINDOW LIFTS • SEAT MOVING MECHANISMS • HUB CAPS
WIRE & CABLE • SPARK PLUGS • METAL FABRICATED ASSEMBLIES • GRAY
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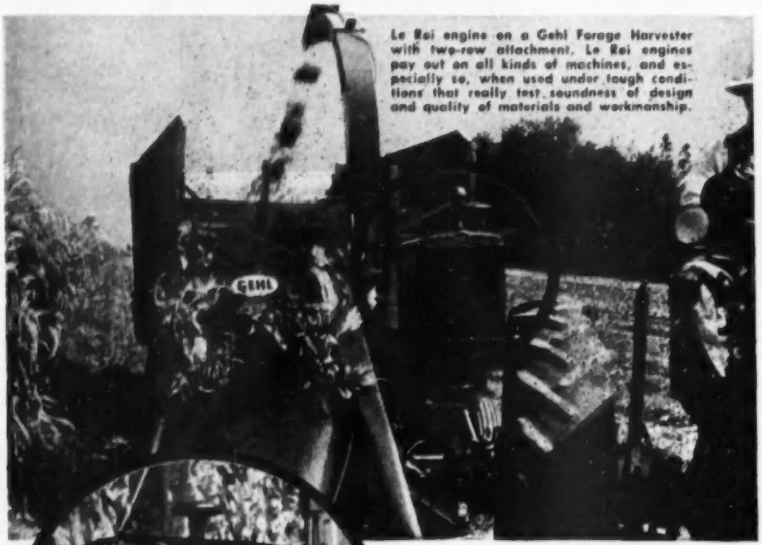
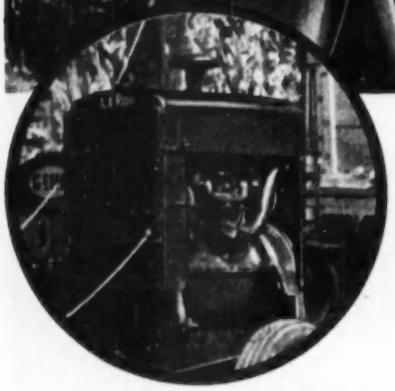
THE ELECTRIC AUTO-LITE COMPANY • TOLEDO 1, OHIO

Tough jobs are easy pickin's for LE ROI heavy-duty power



Le Roi engine on a Gehl Forage Harvester with two-row attachment. Le Roi engines pay out on all kinds of machines, and especially so, when used under tough conditions that really test soundness of design and quality of materials and workmanship.



Built to stand abuse dished out to field equipment without costly breakdowns

LE ROI engines are no automotive lightweight. No, sir. Le Roi builds only heavy-duty engines — power-packed, valve in head engines designed especially for punishing service.

A Le Roi engine is noted for its stamina. Its advanced-design features that mean dependability . . . economy . . . quick field maintenance.

These are a few of the reasons why Le Roi is a leader in the heavy-duty field. They're reasons why you find Le Roi engines powering so many pieces of oilfield, construction, industrial, and agricultural equipment.

There's no doubt about it — Le Roi is your best power buy, whether you're getting new equipment or replacement engines, or whether you're looking for an efficient power plant for the equipment you've designed. Le Roi has a full range of sizes from 15 to 635 hp — for gasoline, natural gas, butane.

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LE ROI

LE ROI COMPANY

A Subsidiary of Westinghouse Air Brake Co. E-97

MILWAUKEE 14, WISCONSIN

Plants: Milwaukee • Cleveland — Greenwich — Dunkirk, Ohio • Coldwater, Michigan

MEN *in the* NEWS

(*Continued from page* 25)

Associated Spring Corp., Bristol, Conn., Divs.—**Harold B. Reid** has retired as sales manager.

General Electric Co.—**Ray W. Bonta** has been named manager of visual education; **James H. Lotridge**, manager of industrial advertising; **William F. Stolberg**, manager of media, and **Richard A. Gleason**, manager of agency and distributor advertising, in the Advertising and Sales Promotion Dept.

Kaiser-Willys of Canada, Ltd.—**C. W. Grinstead** has been appointed general manager.

Allegheny Ludlum Steel Corp.—**Frank W. Ladky** has been appointed assistant to the president.

Kaiser Steel Corp.—**Jack J. Carlson** has been appointed assistant to the vice-president and general manager, and **C. Lee Emerson** has been named general sales manager.

Moraine Products Div., General Motors Corp.—**Frank Brooks** has been named product engineer on brake and special assignments; **Anton Erickson**, assistant in brake research and development; and **Paul Shipe**, assistant in the engineering research laboratory.

Minneapolis-Honeywell Regulator Co.—**Charles B. Sweatt** has been elected vice-chairman of the board, while **Tom McDonald** and **A. M. Wilson** have become executive vice-presidents.

Republic Steel Corp., Alloy Steel Div.—**Sam A. Seckler** has been named an assistant manager.

Bohn Aluminum & Brass Corp.—**Gustav A. Schwenk, Jr.**, and **E. K. Mann, Jr.**, have been elected vice-presidents.

Norton Co.—**Jack M. Esten** has become an abrasive engineer, while **Robert C. Divoll** was chosen a field engineer.

Bendix Radio Communications Div., Bendix Aviation Corp.—**Norman Caplan** was chosen manager of commercial engineering.

Eclipse Fuel Engineering Co.—**Charles R. Wirth** has been named West Coast District representative.

Quaker Rubber Corp.—**Walter Murken** is now production manager.

(*Turn to page* 173, *please*)

DOW CORNING

Silicone News

No. 7 of a Series • PUBLISHED BY DOW CORNING CORPORATION, MIDLAND, MICHIGAN

NOW—SILASTIC RTV—NEW DOW CORNING SILICONE RUBBER THAT VULCANIZES WITHOUT HEAT

Silicone rubber that vulcanizes without heat—that's the big news from our product development laboratories. Known as Silastic RTV (Room Temperature Vulcanizing), this new type of silicone rubber develops excellent high and low temperature stability, water repellency and chemical resistance within 24 hours after application.

The properties of Silastic RTV, outlined in Table I, suggest its usefulness as a cloth dope; as a caulking, glazing and sealing material; as a potting and encapsulating compound for electric and electronic assemblies; and as a casting compound for making flexible molds. Costwise, Silastic RTV is comparable to standard Silastic stocks and pastes.

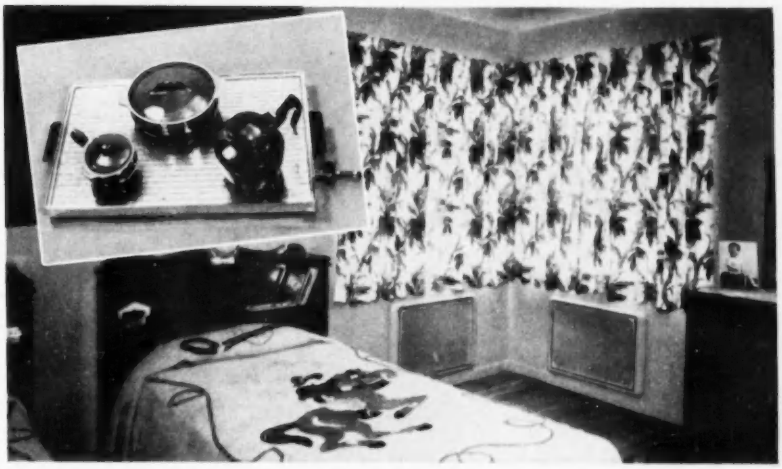
TABLE I

Typical properties of Silastic RTV after curing in 1/8 inch sections

Durometer (Shore A)	15-30
Tensile Strength, psi	130-150
Elongation, %	300-600
Moisture Absorption after 7 days @ 70 F, %	1-2
Dielectric Strength, vpm	350-550
Dielectric Constant	
100 cycles	3.2-3.4
1 megacylce	3.0-3.2
Power Factor	
100 cycles	.015-.030
1 megacycle	.005-.01

Silastic RTV is available in several consistencies with each supplied as two separate components. When the two are mixed in

(continued pg. 2)



Silicone Paint Enables Designers To Perfect Glass Radiant Heating Panels

Design engineers for the Blue Ridge Corporation of Kingsport, Tenn., learned how effectively Dow Corning Silicones can be used to make a radically new idea practical. One of their projects was to produce a radiant heating panel by bonding a bare strip heater to plate glass.

But efforts to realize that basically sound and simple device were frustrated by lack of a sufficiently heat-stable insulating material that would bond to the panel. This problem was finally solved, however, through use of a silicone paint possessing the necessary chemical resistance, heat stability and dielectric properties.

In manufacturing the panels, metallic aluminum is applied to a heated plate of tempered glass. Ribbon-like strips of silicone paint are then applied over the aluminum surface through a silk screen. The panel is then immersed in a caustic bath which etches away the uncoated aluminum leaving only the silicone coated ribbon to which terminal clips are attached. The ribbon becomes a fully insulated electrical element in a "Ra-grid Plate," capable of generating and maintaining temperatures as high as 200 C.

Evidence of the practicality of the "Ra-Grid Plate" is the fact that over a quarter of a million of these units have been produced to date. They are used in military, public, industrial and private buildings as "Glassheat" wall heaters made by the Continental Radiant Glass Heating Corporation. That company describes them as the cleanest, safest and most economical space heating system in existence.

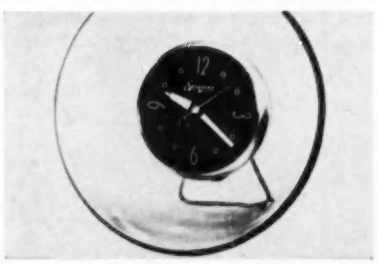
The Salton Manufacturing Company also uses the "Ra-Grid Plate" in their distinctive and efficient food warmers and heated serving trays marketed under the trade names "Hotables" and "Hotrays."

Tests show that prolonged operation at maximum temperatures does not reduce the

(continued pg. 2)

Silicone Oils Make Time Pass More Quietly

It is a well established fact that light silicone lubricants increase the service life and help to maintain the accuracy of the small synchronous motors used in timers for clocks, washing machines and dryers, oil burner controls and refrigerator defrosters.



Another sales feature of these silicone oils has recently been reported by the Sessions Clock Company of Forestville, Connecticut. They say, that, even after years of operation Sessions silicone lubricated clocks are so quiet that a blind-folded person can instantly tell the difference between a Sessions clock and all other clocks! **No. 57**

FOR DATA RELATING TO THESE ARTICLES, CIRCLE REFERENCE NUMBER IN COUPON ON NEXT PAGE

MORE

DOW CORNING Silicone News

NEW DEVELOPMENT AND TECHNICAL DATA

For copies of any of the publications reviewed in this column or for data relating to any of the articles printed in this issue of the Dow Corning Silicone News, simply circle the corresponding reference number on the coupon below.

Dow Corning 7 Emulsion, a water dispersible silicone release agent, is effectively used in the rubber, plastics, plywood and metal fabricating industries. For data on its properties, uses, and application methods, check reference. *No. 61*

●

"Industrial and Laboratory Evaluation of a Silicone Protective Cream", is a clinical report on the effectiveness of a skin cream made with Dow Corning silicones against dermatitis resulting from contact with industrial irritants and sensitizers. Reprints are now available. *No. 62*

●

Use of bare magnet wire coated with new Dow Corning Wire Enamel permits operation of small electric machines and electronic parts at 180 C. Flexibility, scrape hardness and dielectric strength compare favorably with those of the best organic wire enamels. Life expectancy at 180 C is in the range of 50,000 hours compared with 200 hours for wire insulated with conventional enamels. *No. 63*

●

This is the first offering of a new data sheet that describes the properties of parts fabricated of various Silastic stocks and pastes. An up-to-date summary, it includes all of the Silastic stocks now available in commercial quantities and lists typical properties of each. It is a convenient reference guide for designers concerned with the selection and use of silicone rubber parts. *No. 64*

●

"What's a Silicone?" is the title of a 32 page booklet which answers that often asked question in semi-technical terms. Indexed and illustrated, this booklet has earned an international reputation as the most interesting and informative description of silicones ever published. *No. 65*

●

In a recently published article entitled "Uprating Horsepower With Silicone Insulation", the performance characteristics and the factors that must be considered in uprating motors by rewinding with silicone (Class H) insulation are summarized. Several case histories describe how industrial motors have been successfully uprated to deliver 50 to 75% more horsepower. *No. 66*

DOW CORNING CORPORATION - Dept. CI-19
Midland, Michigan

Please send me: 57 58 59 60 61 62 63 64 65 66

NAME _____

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COMPANY _____

STREET _____

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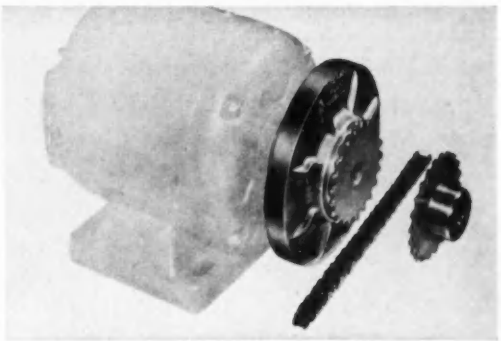
Silicone Fluid In Simplified Fluid Coupling Assures Uniform Performance Over Wide Temperature Range



The Sterner fluid coupling recently introducted by L & S Industries of Norwalk, California, depends upon the inherent stability of Dow Corning 200 Fluid to assure smooth acceleration of inertia loads regardless of operating temperatures.

Surprisingly low-priced, the coupling can be installed in a matter of minutes. No extra couplings, shafts, sheaves, or bearings are required. The coupling is also self-lubricating, and designed to eliminate the need for replaceable seals. Consequently, no maintenance is required.

When stationary, the fluid level is below shaft level. Motion forces the fluid to the periphery of the housing which is of welded construction to prevent leakage of fluid. And because the silicone fluid does not evaporate or oxidize to form gums, one filling lasts the life of the unit.

Dow Corning 200 Fluids are used to accomplish many previously "impossible" improvements in design because they possess an unusual combination of properties including exceptional resistance to oxidation, to shear-breakdown and to changes in viscosity over a wide temperature span. For example, these silicone fluids made it possible to design the heavy duty torsional vibration dampers now used on diesel engine crankshafts and on several makes of automobiles.

In other damping applications including instruments, gauges and dashpots, the use of Dow Corning 200 Fluids increases accuracy and reliability and substantially reduces operating and maintenance costs. *No. 58*

NEW SILASTIC RTV *(continued)*

equal parts by weight, they form a self-vulcanizing system that will "set" in approximately 4 hours, cure in 24 hours and develop optimum properties after 4 to 7 days. Components for the more fluid consistencies can be mixed by stirring; the heavier ones may require a short milling to complete the mixing.

The working life of Silastic RTV can be extended by adding xylene or other suitable solvents to the components before mixing. Stored in closed containers, such solvent containing mixtures will remain workable for as long as three weeks. When exposed to air, they will cure within 2 days after setting and develop optimum properties in 6 to 7 days.

Sections of Silastic RTV up to one-eighth of an inch in thickness can be cured without heat, pressure or full exposure to air. Curing time can be substantially shortened, however, by heating at temperatures up to 300 F after the material has set. Sections between one-eighth and one inch in thickness may be cured at pressures up to 50 psi. *No. 59*

SILICONE PAINT *(continued)*

insulating and protective qualities of the silicone paint on the "Ra-Grid Plate." In actual use, failures have been so rare as to be considered negligible. *No. 60*

First in Silicones

DOW CORNING CORPORATION — MIDLAND, MICHIGAN

Branch Offices:
ATLANTA
CHICAGO
CLEVELAND
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LARGEST PRODUCER OF: *SILICONE* Fluids • Abhesives • Adhesives • Release Agents • Compounds Greases • Water Repellents • Bonding Resins • Electrical Insulating Resins Molding Compounds • Expansible Resins • Defoamers • Silastic

MEN *in the* NEWS

(*Continued from page* 170)

Russell, Burdsall & Ward Bolt & Nut Co.—**George J. Ficken, Jr.,** has been appointed assistant general sales manager.

Food Machinery & Chemical Corp., John Bean Div.—**Harry Schaefer** has been made manager of the Automotive Dept.

Joseph T. Ryerson & Son, Inc.—**Loren B. Clay** was chosen manager of tubular products and cold finished bar sales at the Seattle plant.

Goodyear Aircraft Corp. — **George H. Bancroft** has been placed in charge of the new Detroit field office.

Kaiser Steel Corp. — **Albert P. Heiner** has been named vice-president in charge of public relations.

Consolidated Vultee Aircraft Corp. —**James R. Dempsey** has become program director of one of the company's guided missile projects.

Carter Carburetor Corp.—J. Benton Wilkins has become assistant advertising manager.

Baldwin-Lima-Hamilton Corp.—W. D. Ellis has been made manager of South American sales for Lima shovels, cranes, draglines and pull-shovels.

Westinghouse Electric Corp.—**W. M. Trigg** has been named manager of the new metals development plant to be built at Blairsville, Pa.

Behr-Manning Corp. — **Elmer C. Schacht** has been reelected president, and **Terence A. Cordner** was designated controller.

Norton Co., Abrasive Div.—**Donald L. Price** has been named sales manager.

Paul-Martin Rubber Corp.—**Ward W. Killon** is now assistant sales manager.

Westinghouse Electric Corp., Aviation Gas Turbine Div.—**George L. Duke** has been named manager of purchases.

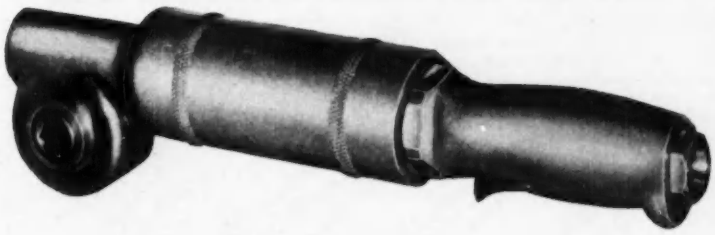
Tube Reducing Corp.—**Graham B. Brown** has been appointed works manager.

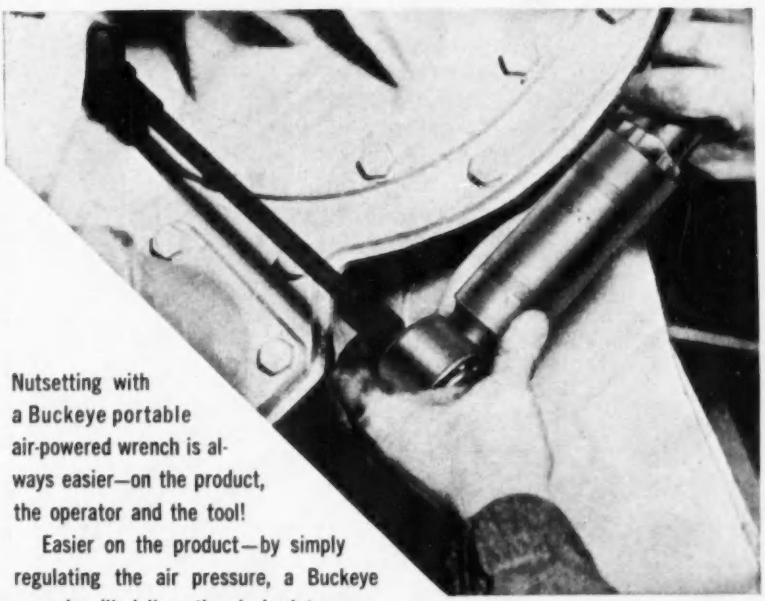
F. J. Stokes Machine Co.—**Charles V. Nicholson** has joined the firm as export product manager.

Mills-Morris Co., Automotive Div. —**C. T. Turner** has been elected vice-president and general manager.

in portable wrenches.

YOUR BEST BUY IS BUCKEYE





Nutsetting with a Buckeye portable air-powered wrench is always easier—on the product, the operator and the tool!

Easier on the product—by simply regulating the air pressure, a Buckeye wrench will deliver the desired torque, up to maximum motor capacity. That means fewer rejects due to work spoilage.

Easier on the operator—there's no need to rely on the "feel" of the work to know when the job is done. Should greater torque be needed, the tool can be used, with the air on, as a ratchet wrench.

Easier on the tool—the Buckeye air wrench is the only tool of this type with power provided through planetary **and** worm gearing. The brunt of the work-load is divided over a much greater gear area. That means less tool wear, fewer and lower tool maintenance costs.

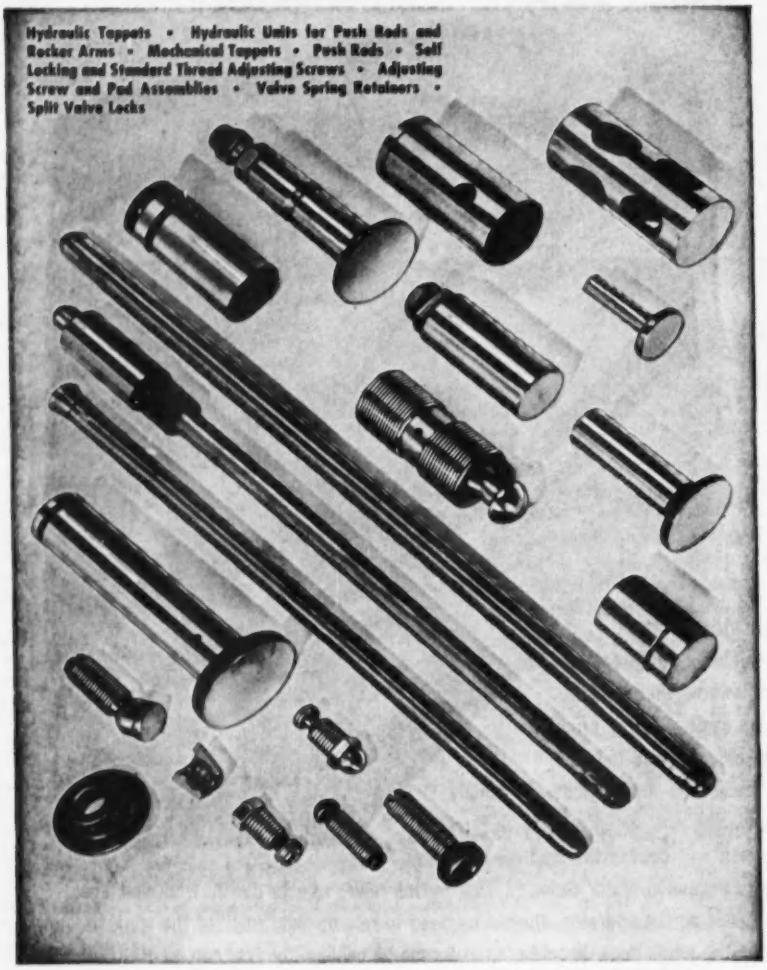
You'll find complete details and specifications in our Air Tools Catalog—may we send you a copy? If you like, we'll arrange a trial-test of a Buckeye angle wrench in your own plant, without obligation.

Buckeye Tools CORPORATION
DIVISION 21 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

"CHICAGO"
precision valve gear parts

●STEEL ●CAST IRON ●STEEL and IRON


Hydraulic Tappets • Hydraulic Units for Push Rods and Rocker Arms • Mechanical Tappets • Push Rods • Self Locking and Standard Thread Adjusting Screws • Adjusting Screw and Pad Assemblies • Valve Spring Retainers • Split Valve Locks

Connecting Rod Bolts.....Hydraulic Cylinder Pistons
Cylinder Head Studs.....Cylinder Head Cap Screws
Main Bearing Studs.....Main Bearing Cap Screws
Flywheel to Crankshaft Screws.....Diesel Energy Cells
Wheel Bolts and Studs.....Differential Carrier Screws
Oil Pump to Distributor Shafts.....Rocker Arm Shafts
Automatic Transmission Valves.....Water Pump Shafts
Roller Followers.....Ball Joint Assemblies

External and Internal Grinding, Thread Grinding, Precision Roll Threading

Heat Treating • Carbon Restoration • Carburizing • Carbo Nitriding • Cyaniding • Hydrogen Brazing • Complete Metallurgical, Dynamometer and Testing Laboratories

Special Screw Machine Parts 1/16" to 5" Diameter • Cold Upset 3/16" to 1" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products

The CHICAGO SCREW COMPANY
2801 WASHINGTON BLVD.
BELLWOOD ILLINOIS
Established 1872

Industry News

(*Continued from page* 23)

cement mixer, lit up more than 40 flood lamps at the same time and operated a score of machine shop tools. It has the power to start up a 10-hp engine and weighs around 300 lb. The generator runs at 3600 rpm.

The generator is installed on the back of the truck. It is turned by a pulley running through a cut-out in the floor and onto a second drive shaft added to the power takeoff shaft. A smaller unit may be developed in the future which would fit under the hood of a truck.

Factory Delivery Program Being Pushed by De Soto

The number of buyers picking up their cars at manufacturing plants has been increasing since the beginning of the year. Some factories have been promoting such programs heavily in recent months.

De Soto just recently put into effect a new campaign to encourage customers from distant points to take advantage of the savings offered by delivery at the factory. Keyed to a vacation theme, the program is being promoted through radio, newspaper, and television advertising. It urges prospects to underwrite travel expenses with money saved on freight charges on a car.

Officials report that factory deliveries of cars at present are at the highest rate of the year. Freight charges on a new car shipped to the West Coast run as high as $400.

Another car manufacturer, Pontiac, which saw an unusual rush of customers from the Pacific coastal states, set up a new 26,400 sq ft building especially for retail customer delivery. The new building houses complete facilities for housing and servicing "will call" cars, and provides comforts of a first-class hotel for out-state buyers waiting to pick up their cars.

Beech to Build T-34 Trainer for Navy

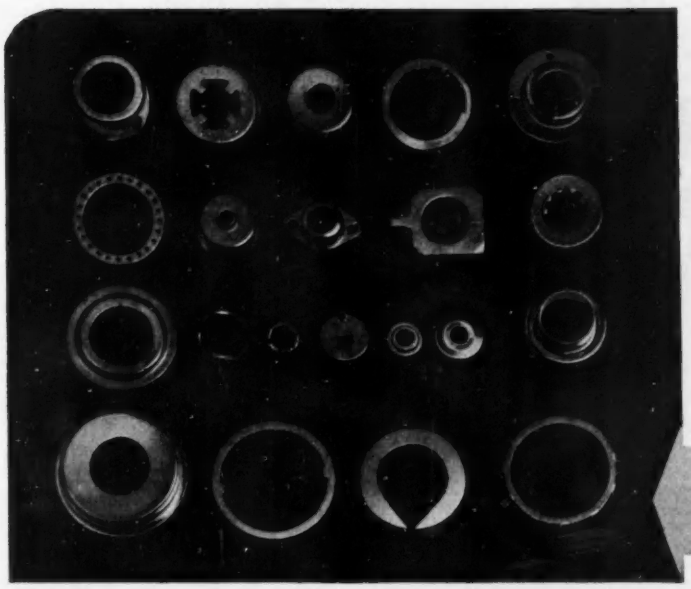
Deliveries to the Navy of the new T-34 all-metal training plane, now in production for the Air Force, are expected to begin within a year. Built by Beech Aircraft Corp., the plane is powered by a 225-hp Continental engine, has a top speed of 180 mph, and weighs about 2900 lb.

(*Turn to page* 176, *please*)

A Source You Can Rely on...
A Name to Remember

Experience is a valuable asset in the development, manufacture and distribution of any product. In this respect we offer you the cumulative benefits of *Continuous Service to Industry Since 1887* . . . including origination and pioneering of mass-production equipment for the economical manufacture of washers.

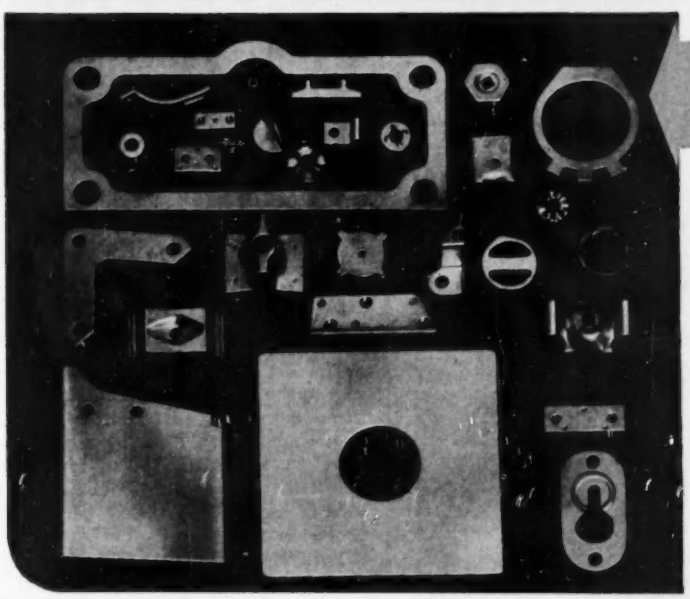
SINCE 1887



No matter what your washer requirements may be . . . whether for U. S. Standard Washers, SAE Washers, Rivet Washers, Lock Washers, Light Steel Washers, Finishing Washers, Machine Bushing Washers or Special Washers of any size, any desired material or finish . . . "MILWAUKEE WROT WASHERS" is the name to remember! Here, in the world's largest plant devoted to this specialized type of production, we have available more than 25,000 sets of dies — a priceless asset in providing the most complete and comprehensive selectivity to meet your needs.

Write for Catalog "30".

WASHERS



STAMPINGS

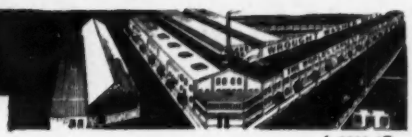
If it can be punched out of metal—if die-making ingenuity and tool-making facilities can provide the means for producing stampings to meet your production specifications; if the job can be handled most advantageously as a stamping—again, "MILWAUKEE WROT" is the name to remember. Here is a soundly established source of supply you can rely on — plus *Quality Standards* that are a source of pride to us, as manufacturers, and a source of satisfaction to our most discriminating customers. We'd like to serve you.

Let us quote on your requirements . . . covering fabrication in any material and in any finish. Furnished machined, heat-treated or surface-ground, as may be specified.

WROUGHT WASHER MFG. CO.

THE WORLD'S LARGEST PRODUCER OF WASHERS

2212 SOUTH BAY STREET • MILWAUKEE 7, WISCONSIN



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Industry News

(*Continued from page* 174)

U. S. Steel Contemplates $300 Million Financing

U. S. Steel Corp. has announced a proposal to sell $300 million serial debentures maturing in one to 10 years. It is expected that $225 million will be offered to the public through a nationwide group of underwriters, and the remainder of $75 million will be reserved for offering to the U. S. Steel & Carnegie Pension Fund, trustee of a pension trust established for the benefit of U. S. Steel employees.

As soon as possible a registration statement will be filed with the Securities and Exchange Commission, and the offering will be made at a convenient time thereafter. The proceeds of the contemplated issue will be used to restore in part working capital expended in recent years in the company's expansion and modernization programs.

You benefit from TEAMWORK with a...

Lamb Electric

SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTOR

• You depend on your engineering department to design the products you sell.

With the same confidence you can depend on our engineering department to design electric motors to meet your exact mechanical and electrical requirements.

Your engineers and ours working together can develop a product that will be outstanding in performance, dependability and appearance.

To obtain the maximum benefits from this teamwork we should get together while your product is still in the design stage.

The Lamb Electric Company • Kent, Ohio

In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario

They're Going Into America's *Finest* Products

Aircraft hydraulic pump motor with maximum output, minimum weight. Adaptable to many heavy-duty industrial applications.

Lightweight universal motor for portable devices requiring a self-ventilated, high-speed motor.

Lamb Electric

SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

New Car Test Building Completed by Chevrolet

Chevrolet has completed a new engineering building which will quadruple the space previously available for testing its cars at the General Motors Proving Ground. The structure measures 195 by 260 ft and conforms in overall design to other buildings at the outdoor testing laboratory.

Featuring some of the most modern equipment of its type, the building has a room in which motionless air permits absolute temperature control to plus or minus one degree and a bed plate for measuring vehicle heights to a 30,000th of an inch. There is also an elevator, which drops into the floor when not in use, and a room which has weighing devices that are said to assure exact load distribution on all four wheels of a vehicle.

New Computer Center Opens

Electronic Associates, Inc., scheduled the opening of its new computation Center at Princeton, N. J., for July 14. Among the equipment available to industry on a rental basis is an analog computer for solving design, dynamics, hydraulics and other problems.

GM's New Copper Mill Rising Near Warren, O.

A new plant to house Packard Electric Division's copper rod mill is being constructed by General Motors Corp. near Warren, Ohio. Slated to open early next year, the one-story plant will cost more than $1 million. In addition to producing copper rod, the plant will have facilities for expanded wire drawing and magnet wire, nylon and plastic insulating and extrusion.

Ad Outlay of Big Three In '53 Hits $66 Million

The Big Three car companies last year spent close to $66 million on national newspaper advertising. Leader in the amount paid out by any company for advertising in all types of industries was General Motors with $32.944 million, about 63 per cent above the 1952 figure.

Ford Motor Co. rose from fifth to second place in spending $18.278 million last year, an increase of 68 per cent. Chrysler moved up from fourth to third spot with an expenditure of $14.582 million, or 24 per cent above 1952.

(*Turn to page* 181, *please*)

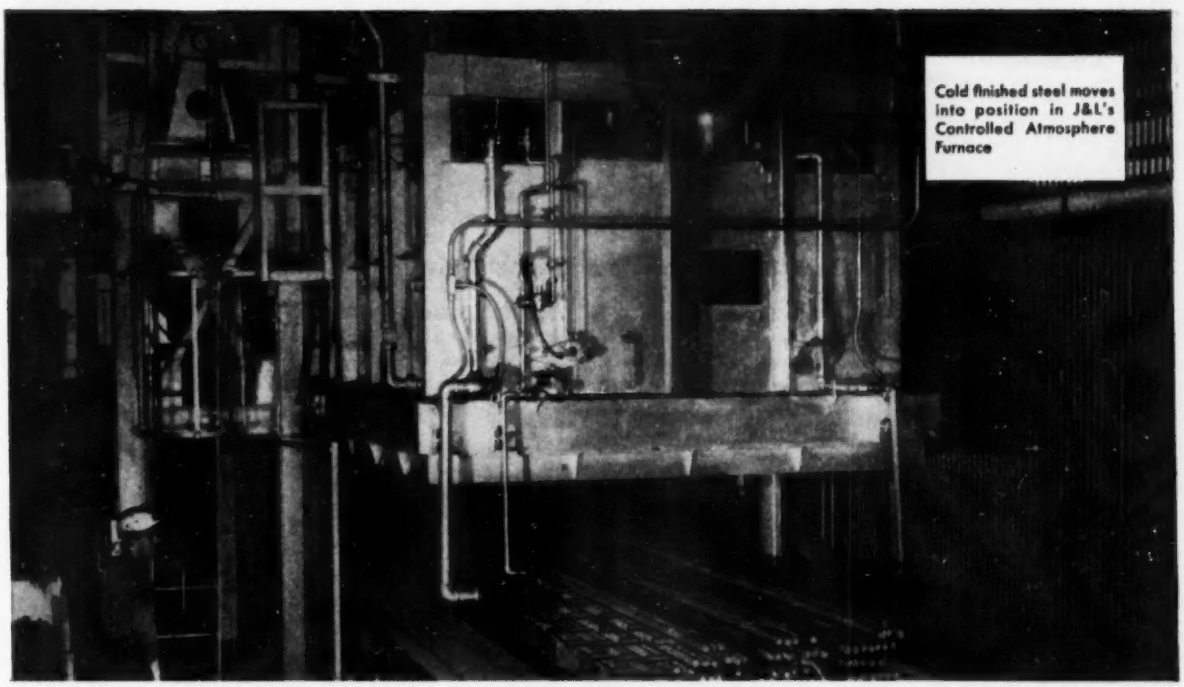
Cut Your Production Costs

whatever treatment you need:

- bright annealing
- case carburizing
- normalizing
- stress relieving
- carbon restoration

thermal treatment in prepared atmosphere furnace

saves you time
lowers over-all costs



Cold finished steel moves into position in J&L's Controlled Atmosphere Furnace

Why incur the trouble and costs of thermal treatments when J&L can do the job for you . . . quickly and economically? J&L's Controlled Atmosphere Furnace can be employed to improve the machinability or to meet the mechanical properties you need in your bar stock.

Order J&L Cold Finished Bars—thermally treated to the needs of your production line.

Jones & Laughlin
STEEL CORPORATION – *Pittsburgh*

J&L STEEL

Jones & Laughlin Steel Corp., Dept. 430
3 Gateway Center, Pittsburgh 30, Pa.

Without obligation please send me your booklet "Extra Services to Users of Cold Finished Steel."

Name_____

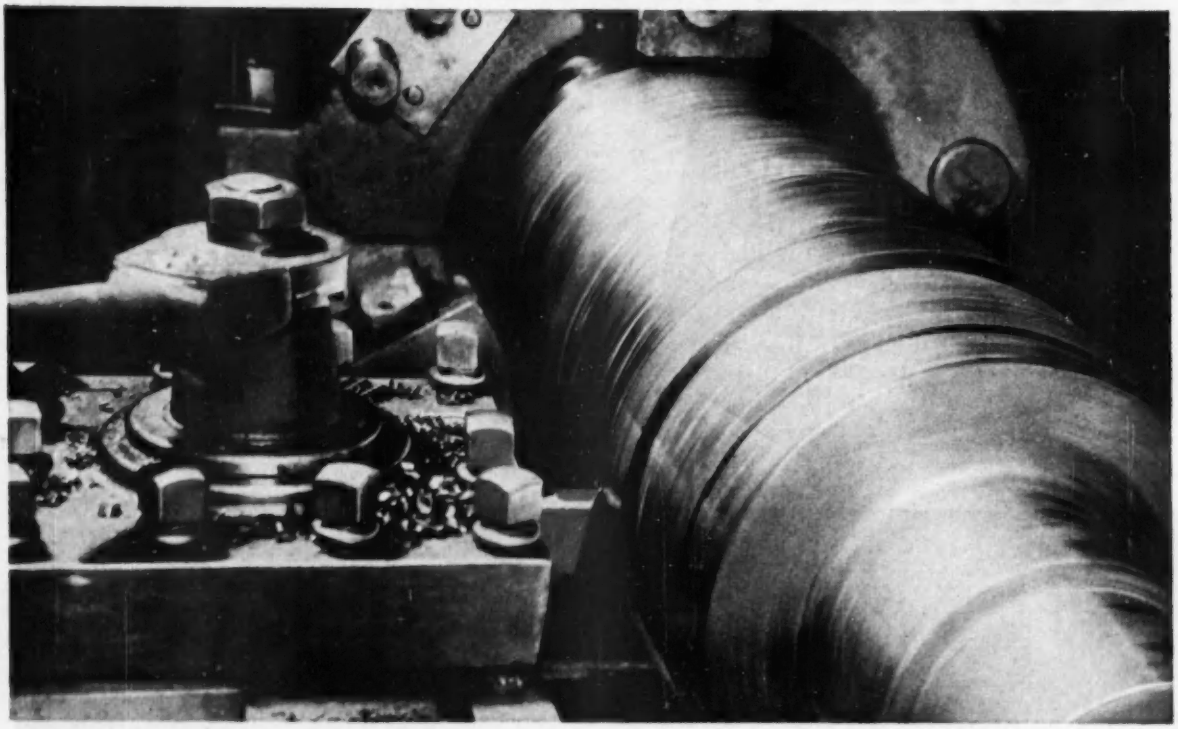
Title_____

Company_____

Address_____

_____

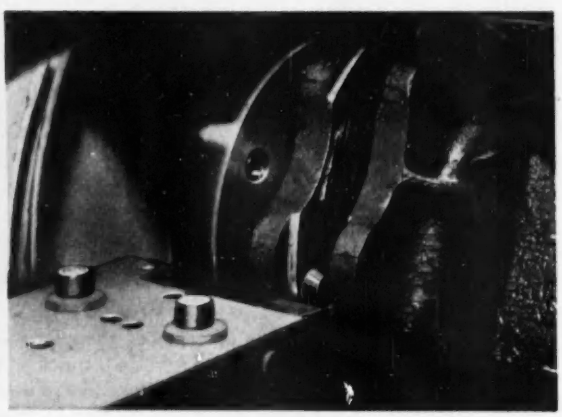
CARBOLOY ANNOUNCES NEW GRADE 350 CARBIDE



CARBOLOY GRADE 350 for light roughing, general finishing of steel

ELECTRIC MOTOR SHAFT. Carboloy Grade 350 increased the number of linear inches cut by 30% over other carbides used for roughing and finishing this steel motor shaft.

SETUP: Material—AISI 1045 modified (hot-rolled). **Speed**—300 SFPM. **Feed**—0.020 inch. **Depth of cut**—1/16 to 1/8 inch. **Coolant**—Yes.



CARBOLOY GRADE 370 for heavy-duty steel cutting at higher speeds

JET ENGINE TURBINE WHEEL SHAFT. A single Grade 370 tool now handles roughing and finishing at General Electric's Lynn River Works. Formerly, two tools were needed. Though operating at around 1700° F., Grade 370 increased tool life at least 40%.

SETUP: Material—4340 steel with Brinell hardness from 269 to 321. **Speed**—200 SFPM. **Feed**—0.018 inch. **Depth of cut**—3/8 to 3/4 inch. **Coolant**—No.

TRANSMISSION CASING for fork lift truck. Machine downtime was sliced 50% and tool life extended almost 40% when Yale and Towne switched to Grade 370. Despite irregular steel casting, tool life on plunge facing operating increased 5 times with Grade 370.

SETUP: Material—Irregular cast steel with chilled spots and sand occlusions. **Speed**—318 SFPM. **Feed**—0.006 inch. **Depth of cut**—3/16 to 1/2 inch. **Coolant**—No.

FOR LIGHT ROUGHING, GENERAL FINISHING OF STEEL

On-the-job tests show that Grade 350 cuts faster, lasts longer than existing carbides; boosts production up to 30%

Carboloy® Grade 350—the second of the new Series 300 steel-cutting carbides—combines superior wear resistance and extreme toughness to an extent never before possible in the light roughing and general finishing range of steel machining. This has been proved during exhaustive on-the-job customer tests and applications. Grade 350 is outperforming all existing carbides by up to 30% in this medium-duty range.

Built-in Tip Rigidity

A new, carefully controlled manufacturing process gives Grade 350 a unique grain structure and built-in structural rigidity. This rigidity enables Grade 350 to effectively resist the high temperatures (around 1800°) encountered during high-speed machining . . . conditions which cause the cutting edges of other carbides to deform.

Two Steel-Cutting Grades Now Available

Grade 370 for heavy-duty steel cutting, introduced late in 1953, was the first of the new Carboloy Series 300 carbides. Now Grade 350 extends the machining range of this new series to medium-duty steel cutting. Both grades are available immediately in a wide range of Standard Carboloy Tools and blanks. Send coupon, today, for new Price List (GT-300) containing complete specifications and ordering information.

GRADES 350 AND 370 STOCKED IN WIDE RANGE OF STANDARD TOOLS AND BLANKS

For light roughing and general finishing of steel		For heavy-duty steel cutting	
GRADE 350	**STOCK ITEMS** **Blanks**—6 styles, 40 sizes **Tools**—5 styles, 20 sizes	**GRADE 370**	**STOCK ITEMS** **Blanks**—6 styles, 55 sizes **Tools**—9 styles, 26 sizes

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLOY
Department of General Electric Company
11151 E. 8 Mile Road, Detroit 32, Michigan

☐ Send Price List GT-300, containing specifications and prices on new Grades 350 and 370

☐ Have a Carboloy Field Engineer call

Name_____ Position_____

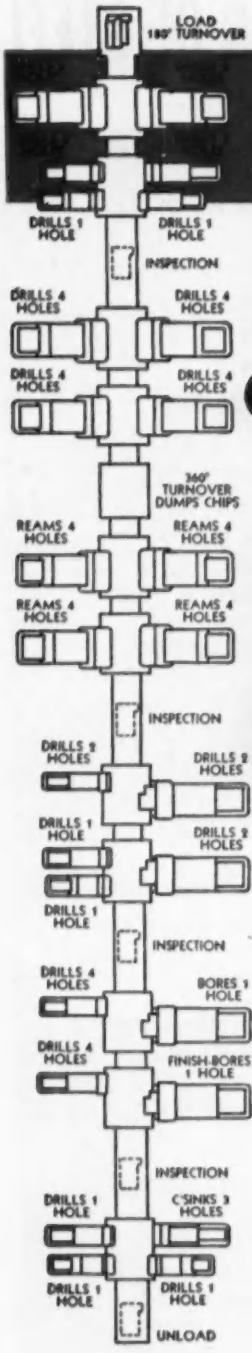
Company_____

Address_____

City_____ Zone_____ State_____

GREENLEE

TRANSFER MACHINES



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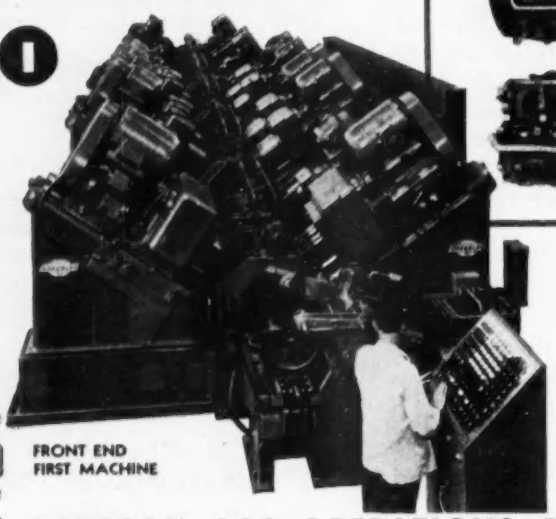
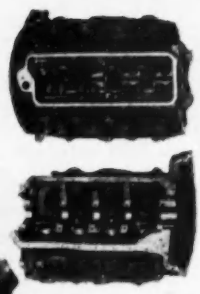
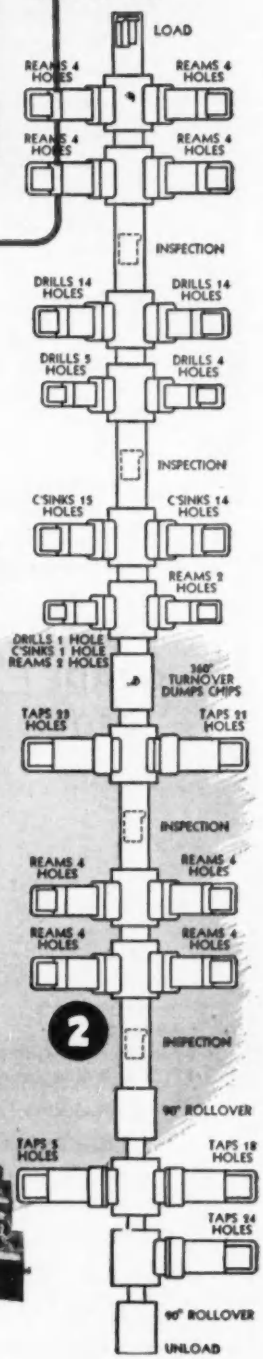


FRONT END
FIRST MACHINE



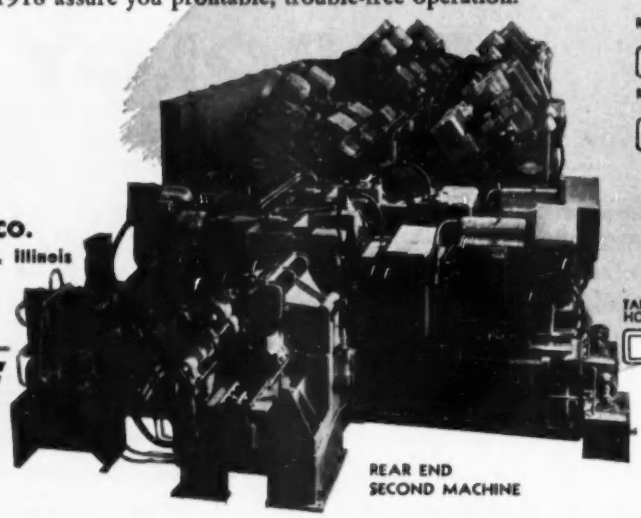
NEW V-8 BLOCKS



PERFORM 289 OPERATIONS ON V-8 CYLINDER BLOCKS AT 75 BLOCKS PER HOUR

New tooling for a brand new V-8 motor includes three lines of Greenlee Automatic Transfer Machines similar to the units illustrated. Each 2-machine line performs 289 operations on cylinder blocks during a 45-second cycle.

Sound construction, proved engineering, and a background of experience in building special machinery that dates back to 1918 assure you profitable, trouble-free operation.



REAR END
SECOND MACHINE

GREENLEE BROS. & CO.
1757 Mason Ave., Rockford, Illinois

PRODUCTION MACHINERY
GREENLEE

Industry News

(*Continued from page* 176)

Numerous Topics Studied At ASTM Annual Meeting

Thirty-six technical sessions, at which were presented 110 technical papers covering various aspects of engineering materials, featured the 1954 Annual Meeting of the American Society for Testing Materials. Held last month at Chicago, it also included 600 meetings of the technical committees.

Norman L. Mochel, manager, metallurgical engineering, Westinghouse Electric Corp., was elected president for 1954-1955. R. A. Schatzel, vice-president and director of engineering, Rombe Calbe Corp., is the new vice-president.

New members of the board of directors are as follows: E. J. Albert, president and treasurer, Thwing-Albert Instrument Co.; J. M. Campbell, administrative director, Research Labs. Div., General Motors Corp.; P. V. Garin, engineer of tests, Southern Pacific Co.; J. H. Jenkins, chief, Forest Products Laboratories of Canada; and D. E. Parsons, chief, Building Technology Div., National Bureau of Standards.

Army Extends Contracts Of Three Automotive Firms

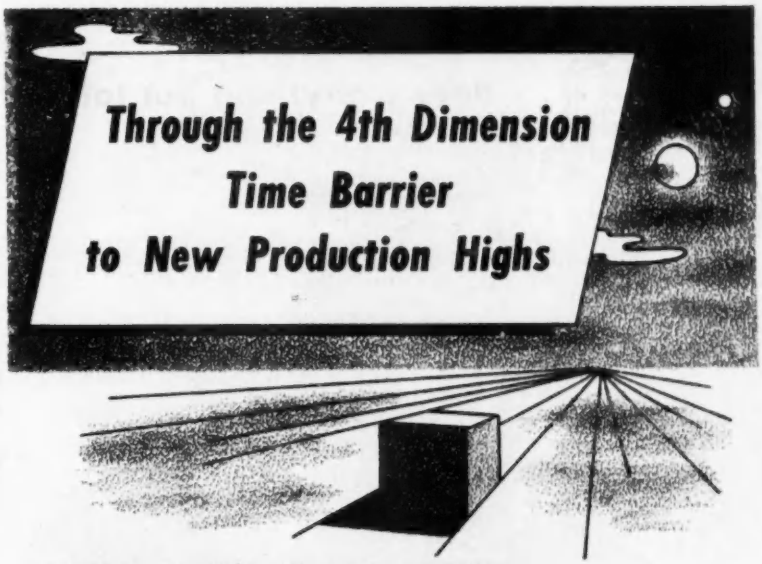
Defense contracts of three automotive manufacturers, which were to expire at the end of June, have been renewed by the Detroit Ordnance Tank - Automotive Command. Included in the extension of assignments are Chrysler Corp., GMC Truck & Coach Div., and Reo Motors, Inc.

Chrysler, which has been turning out ¾-ton trucks for the Army, had its contract, valued at $270 million, stretched out to the end of July. GMC and Reo, whose combined contracts since first let amount to more than $876 million, had them lengthened until September or October. Both GMC and Reo have been producing 2½-ton trucks for the Army

Suspended Pedals Planned On '55 Plymouth, Dodge

Latest information indicates that suspended brake and clutch pedals will probably appear on the Plymouth and Dodge lines next year. It is also reported that Chrysler cars will go to the push-button latches for the first time in the next new models.

(*Turn to page* 182, *please*)



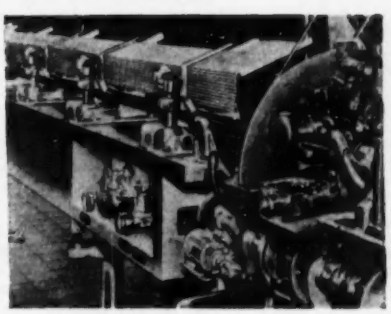
LIPE AML BAR FEED

gears machine production to the steady flow of Time

ALL industrial results are achieved in Time . . . *vital 4th dimension that measures output, costs, profit.* Shorten the time gap between operations . . . shorten the time when machines are "cutting air" . . . keep machines producing at a steady optimum rate during the fatigue slow-down from 10:30 to noon, and from 3 P.M., till closing time . . . *and you are getting 4th Dimension production.* Production that is geared to the steady flow of Time.

Lipe AML Bar Feed Produces from 30% to 100% More Output by Eliminating Time Losses . . .

Time losses account for the enormous differences in output among workmen. By eliminating these losses automatically, the Lipe AML Bar Feed boosts overall production from 30% to 100%. That's because stock is fed to the machine independent of the operator. Constant pressure behind the stock assures uniform speed of feed. No feed fingers to fail or mar stock. No multiple feed-outs, even on the longest pieces.



Mail the coupon now for free literature giving full details on the Lipe AML Bar Feed.

LIPE ROLLWAY

LIPE ROLLWAY CORPORATION
Syracuse 4, N. Y.

Sure, I'd like to know more about the Lipe AML Bar Feed. Send me your free booklet.

Name_____ Title_____

Company_____

Street_____

P.O._____ Zone_____ State_____

this new NAZEL ELECTRO-PNEUMATIC No. 6 "TYPE C"
FORGING HAMMER

just look at these features!

- Outboard Ram Guide, which allows both open and closed die forging and insures positive die mating . . . Anvil is mated to base for exact register.
- Die capacity is exceptionally large. Upper die shown is 14" by 40" by 7".
- Hydraulic Power Control . . . gives "feather touch" treadle or hand control changeable or removable for convenience.
- Light to heavy blow at touch of Control to suit job. Coining, planishing or forging.
- Direct Power Drive, with pinion running in oil for longer life.
- Modern Lubrication to *all* moving parts.
- Completely self-contained!
- This new NAZEL No. 6 "Type-C" is a floating ram hammer at its best . . . designed for continuous production, proper forging ratio . . . and, it is *economical!*

Further details are yours upon request.

LOBDELL UNITED COMPANY

1836 WILMINGTON 99, DELAWARE 1954

A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY

Industry News

(*Continued from page* 181)

Goodrich Charges U. S. Rubber Infringed on Tire Patent

U. S. Rubber Co. has said there is no merit in the suit brought against it by B. F. Goodrich Co. which charges infringement on its patent for tubeless tires. Expressing the belief that the patent is invalid, U. S. Rubber stated that tubeless tires had been developed and tested many years prior to the date of the Goodrich patent.

U. S. Rubber claims it developed the tubeless tire as long ago as 1934. A similar suit filed by Goodrich against Firestone Tire & Rubber Co. is pending in the U. S. District Court in Cleveland. In its suit, Goodrich claims invention of the tubeless tire in 1947 and that it has sold more than three million of them since then.

GM Apparatus Weathers Paint 20 Times Faster

A device, which reportedly will weather paints, enamels and lacquers 20 times faster than the most extreme outdoor conditions, has been built by General Motors Corp. Called "Little Florida" and resembling a lottery drum, the device has a 1200-watt high pressure mercury arc lamp inside for its "sun" and an artificially created "dew" cycle, which is said to hasten paint deterioration.

The apparatus can wear the glaze off car paint within two weeks, according to GM. Ordinarily, it takes from six months to a year to dull the paint under severe weather conditions.

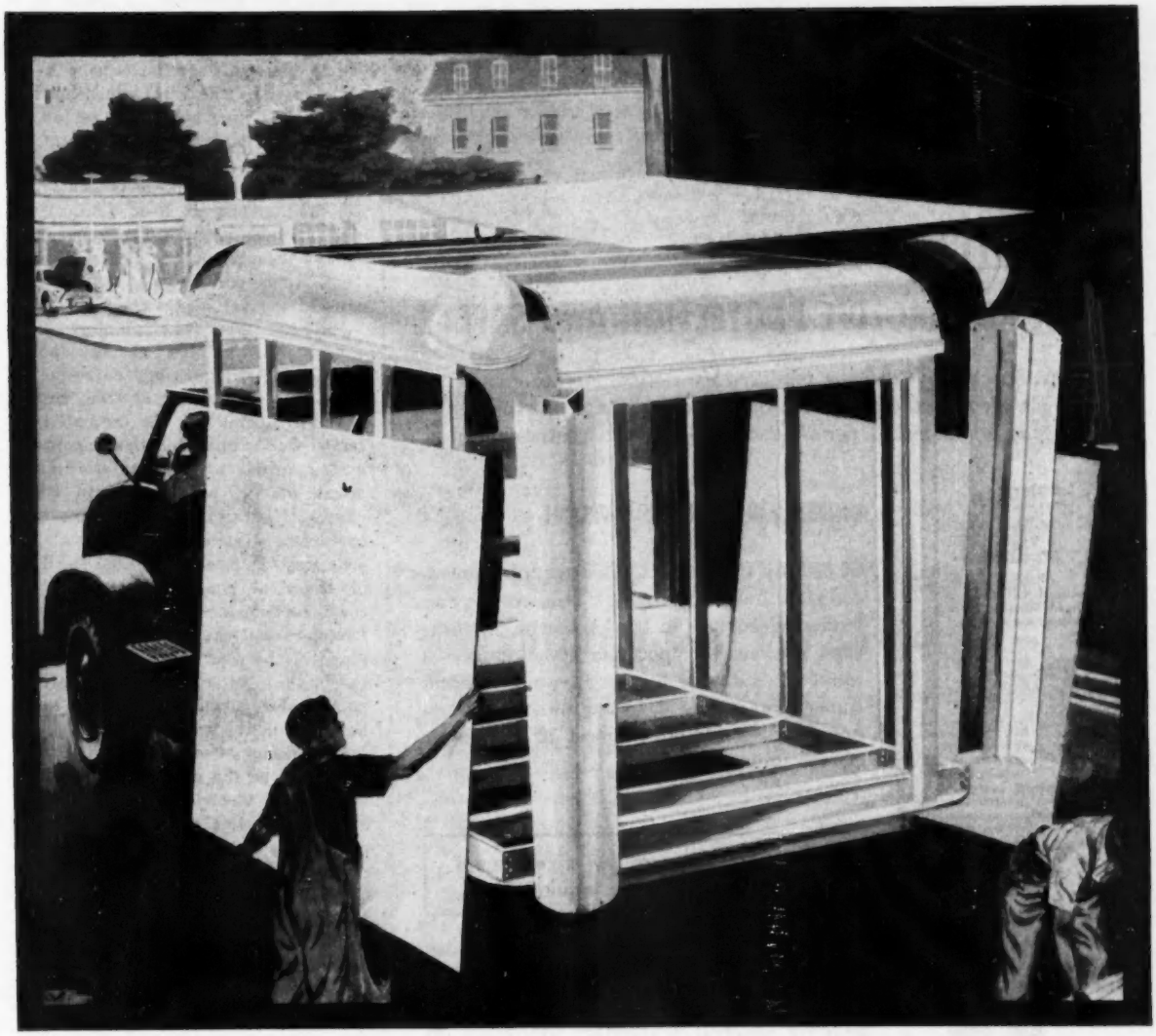
German Engine, French Jet Canadian Show Highlights

On display at the recent Canadian International Trade Fair was an air-cooled Diesel bus designed specifically for Canadian operators. Built by Prevost Coach Co. and powered by a German Deutz engine, it is expected to enjoy wide acceptance in North America. The engine was also shown installed in a Canadian truck for use in sub-Arctic areas.

The aircraft section of the show, the first one ever incorporated in the exposition, featured a number of U. S., Canadian, and British exhibits. Particularly eye-catching was a model of a French commercial jet transport. Although built on the general lines of the British Comet, it has two jet engines located close to the rear.

(*Turn to page* 188, *please*)

Stronger, lower cost custom bodies built faster with Alcoa shapes



Alcoa® Aluminum Truck Body Shapes are in stock at your nearby Alcoa distributor. They are Alcoa Extrusions—precision engineered, putting the metal where it's needed. They eliminate costly build-ups and subassemblies, greatly reducing your construction costs and time.

Among the many items stocked by Alcoa distributors are flooring, side sills, cross members, side posts, rub rails, top rails, roof bows and corner posts . . . Alcoa Angles, Tees and Zees for door framing, tail gates and other special applications . . . Alcoa Sheet and Plate for roofs and side sheets, doors and tail gates. And all are made to high Alcoa standards of alloy and workmanship.

These lightweight, cost-cutting shapes are readily available from your local Alcoa distributor . . . listed below. Write for the booklet, *Truck Bodies Fabricated From Alcoa Aluminum.* ALUMINUM COMPANY OF AMERICA, 1841-G Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM

ALUMINUM COMPANY OF AMERICA

Versatility of Electronic Computers

THE amazing versatility of electronic computers is well illustrated in two reports issued recently, and points up the strides being made in the utilization of these invaluable, high speed calculating machines by industry. Although installations of such equipment were restricted to military applications only a few years ago, the analogue and digital computers now are real work horses in plants and university laboratories.

In a recent issue of *BCA News*, The Barber-Colman Co., Rockford, Ill., known as one of the leading machine tool producers, reported on the installation of an analogue computer in its aircraft development department. The company, said to be a pioneer in the field of aircraft cabin temperature controls for jet fighters, recently decided that conventional testing methods were too slow and too cumbersome to cope with evaluations of temperature changes that can vary momentarily from minus 40 F to plus 700 or 800 F. From this conclusion was born the new analogue computer, designed and built by the company.

In order to analyze the performance of the complete system, the characteristics of each component are determined and expressed in terms of a mathematical formula. The fact that, in many cases, the action of one or more electrical components can be expressed by the same mathematical formula is then utilized to set up an electrical counterpart for many of the elements of the system. For example, electrical charge is analogous to the amount of heat (B.t.u.) in the actual system. The movement of this charge, or the electrical current, then corresponds to the air flow of the actual system which carries heat from one point to another. The voltage at any point in the electrical analogy corresponds to the temperature at the corresponding point of the actual system. Capacitors in the electrical system, which are used to store electrical charge, are similar in their characteristics to the thermal mass of the actual system; and electrical resistance, which tends to resist the flow of electrical charge, corresponds to the insulation of the actual systems. Resistors and capacitors can be combined in the electrical analogy to lag the build-up of a voltage at a given point and thus can be used to simulate heat lags in the actual system.

By taking advantage of physical laws such as the above, it is possible to set up an electrical circuit, by suitable mathematical analysis, which will perform in the same way as the mechanical system it simulates. Operation of the system is evaluated in the computer approach by reading the voltage (which corresponds to the temperature) at points corresponding to cockpit locations. Since it is usually necessary to determine the dynamic characteristics of the system, a continuous strip chart recorder is employed to show voltage variations and provide a permanent record for detailed study.

The computer is made up of a large number of capacitors, resistors, and other electrical components, connected to terminals on the front of the unit. By connecting these components in the proper manner, using plug-in cords, any desired system within the capacity of the machine can be simulated. Greatest advantage of the computer over a mechanical test setup is that the various factors can be varied readily merely by changing the

Specialized Service

IN AUTOMOTIVE PROTECTION AND SAFETY

United Specialties Company produces a variety of steel-processed products for the automotive and other industries that contribute materially to improved performance, economy and satisfaction.

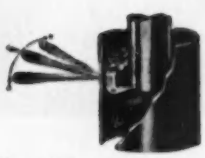
Combination Oil Bath Air Cleaner and Silencer for use on down-draft carburetors.

Plastic pre-cleaner is easily attached — has a transparent dust chamber — reduces air cleaner servicing frequency — saves oil — fits practically any center tube air cleaner.

UNITED AIR CLEANER DIVISION

Oil Bath Air Cleaners — United manufactures a complete line of oil bath air cleaners for protection of engines in trucks, busses, tractors, cars, stationary or portable power units — a range of models to fit every type of internal combustion engine including diesels. United has designed and built almost 20 million air cleaner units.

Our sales engineers will give prompt attention to your inquiries.

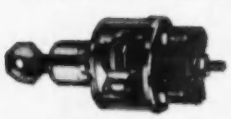


Concealed type, six-wire turn signal switch. Uses regular front and rear park or stop lights. Signal is self-cancelling.

MITCHELL DIVISION

Semi-Automatic, Self-Cancelling Turn Signal Switch built by Mitchell is standard equipment on many cars and trucks.

Mitchell Ignition Switch has an industry-wide reputation for dependability and extra long life. "Radio" position reduces battery drain with motor off.



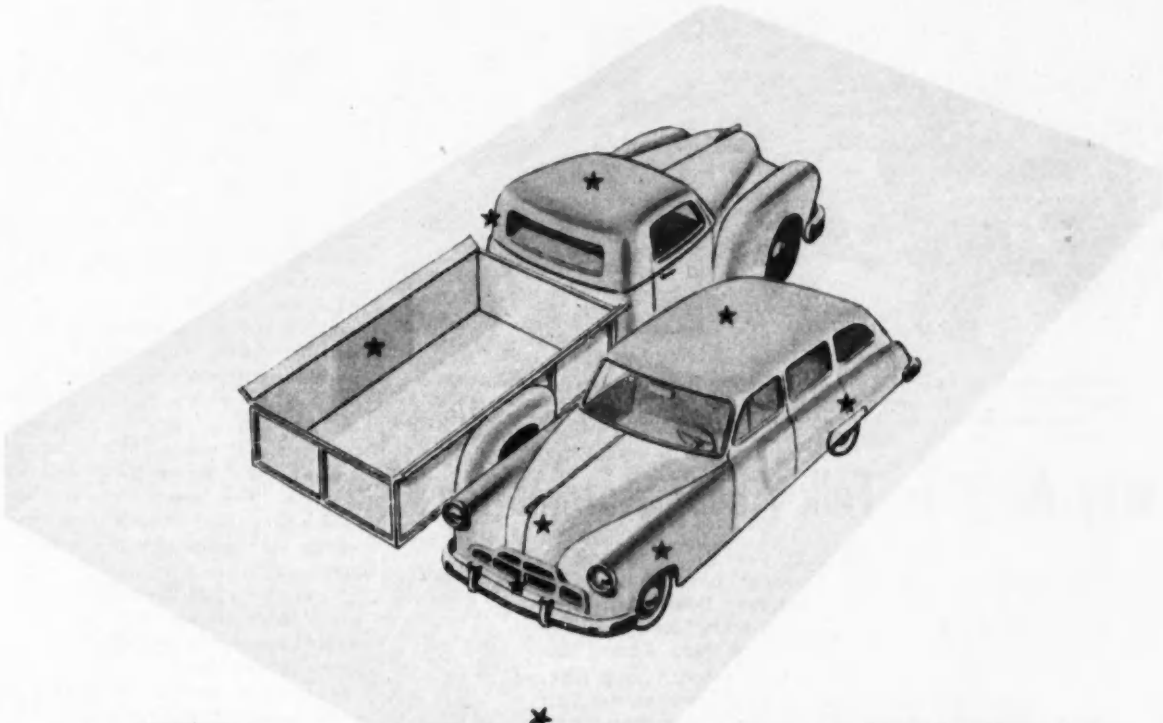
Conventional type ignition switch used on popular makes of cars and trucks.

Rolled Shapes, stampings and dovetails are offered by Mitchell in a complete range of metals, gauges and designs.

UNITED SPECIALTIES COMPANY

UNITED AIR CLEANER DIVISION — CHICAGO 28

MITCHELL DIVISION — PHILADELPHIA 36 • BIRMINGHAM 11, ALABAMA



★ Fenders and panels

★ Station wagon rail decorative trim

★ Tops and inner liners

★ Grills and fan shrouds

Here's Where General's "Syloy*" Reinforced Fiberglas Improves Appearance and Performance . . .

General's custom molded "Syloy" fiberglas laminates have taken to the road in trucks and autos in the form of cab panels, body tops, dashboards, decorative trim and other parts calling for tough, maintenance-free qualities with high surface appeal.

Manufacturers have discovered the amazingly versatile qualities of this road-proved product . . . it is lighter than steel, immune to weathering and chemicals, incredibly resistant to bending and hard blows, and will hold color for the life of the product.

In addition to custom molding of Syloy, our package design and manufacturing applies to molded and extruded rubber and plastics, metal stampings, vibration control units, oil and hydraulic seals, and sponge rubber items.

For literature or information from our field representative just fill out the coupon below.

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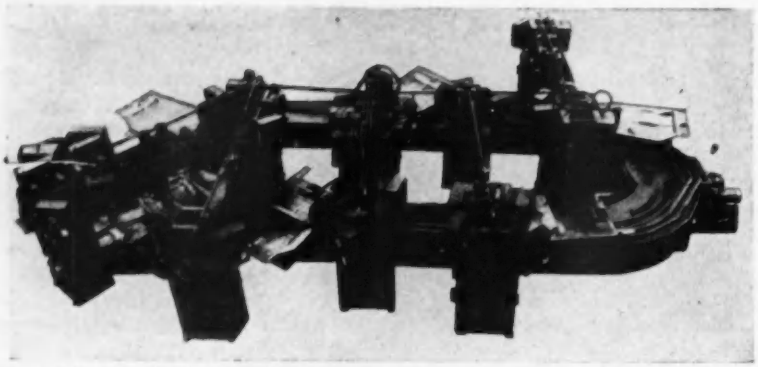
AI-7-54



Early example of Federal Resistance Welding Automation is this Floor Pan Welder for a leading automobile builder. Placed into operation in 1938 it featured continuously moving fixtures and walking guns. Produced 250 units per hour.

Why All This Talk About Automation?

The automatic handling of work in process isn't a new idea. Leading manufacturers in almost every metal working field have been using "automated" machinery for years to increase the productivity of their work.

The talk about automation today, of course, is a result of the concentrated effort on the part of vast numbers of manufacturers, large and small, to stay competitive by trimming production costs whenever possible.

Federal, for almost a quarter century, has been working with such people in developing resistance welding machinery that would reduce costly, non-productive handling to a minimum.

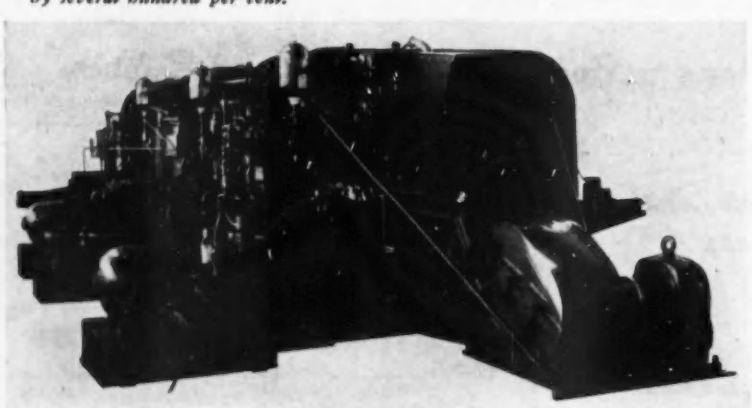
While automation may be new to many machine builders Federal design engineers have piled up 25 years experience in designing and building automatic handling and assembling equipment, dial, shuttle and transfer feeds for resistance welding. A big reason why you should take your welding problems to **"Federal — First in Resistance Welding."**

Federal® WELDERS

Warco® PRESSES

The Federal Machine and Welder Co., Warren, Ohio

Modern Example of Resistance Welding Automation is this Federal Special Three-Station Transfer Type Muffler Assembly and Welding Machine. It produces 600 complete assemblies per hour. Reduced labor forces required by several hundred per cent.



electrical hook-up whereas the mechanical counterpart requires lengthy time-consuming changes.

A somewhat similar report on a digital computer appeared in the *Dow Diamond*, June, 1954. The Dow Chemical Co. operates its own computation research laboratory and employs an IBM computer of digital type. The laboratory also has an installation of "EASE"—electronic analogue simulating equipment. Typical example of what can be done with the digital machine occurred recently when a research scientist inquired about the possibility of improving a plastic formulation by certain changes in process involving a variety of variable conditions. It was estimated that an answer might involve some 8-billion answers. The laboratory also indicated that the problem was well within the capabilities of the equipment.

Some time after the laboratory was placed in operation, Dow engineers wanted to investigate the behavior of gases issuing from the smokestack. The problem involved the effects of such variables as barometric pressure, air temperature, wind velocity, height of stack, gas temperature, and other factors. The problem was set up for the computer and approximately 14 hours later—with 70,000 answers—the machine stopped after producing a complete record for analysis. In this instance, the computer had explored for the first time all of the variables in an old but complex problem.

BOOKS . . .

MANUAL OF EXCELLENT MANAGEMENTS, 1954, *published by American Institute of Management, 125 E. 38th St., New York 16, N. Y. Price, $20.00.* The companies listed in the manual are the result of a year's study of some 4000 businesses through the U. S. and Canada. The book lists all 348 excellently managed companies in four basic lists, broken down alphabetically, for ease of reference, by industry, geographically, and by the Institute's rating within the companies themselves. There are also supplementary lists showing the companies with the greatest growth potential, the best records of stability of net income, and the most outstanding outside boards of directors. A final listing shows the uninterrupted cash dividend records of the companies.

TRAFFIC ACCIDENT INVESTIGATOR'S MANUAL, *published by the Traffic Institute, Northwestern University, 1704 Judson Ave., Evanston, Ill. Price, $3.50.* A 285-page textbook, this new publication covers the basic problems confronted by the traffic accident investigator at the operational level. It contains more than 100 photographs, charts, tables, and diagrams.

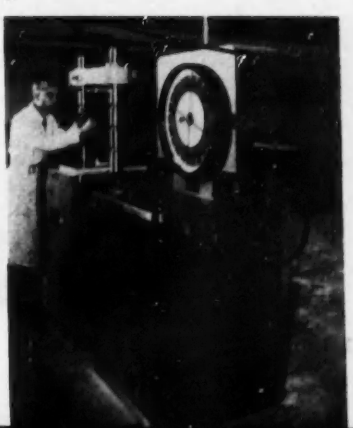
LOCKHEED AIRCRAFT REPORTS:

"Our Baldwin FGT SR-4® testing machine is invaluable!"

"We don't have 'routine' production line tests . . . each test we get is likely to be entirely different from any we've run before," explains the Engineering Test Group of Lockheed Aircraft's Engineering Test Laboratory, Marietta, Ga. "That's why the new Baldwin-Emery FGT SR-4 Universal Testing Machine fits our needs so well. This single revolutionary machine is not only easy to operate and extremely accurate, but is flexible as well."

These photographs show just two of the diverse tests Lockheed is making on their 50,000 pound FGT machine . . . the closeup shows a round piece of aluminum stock being tested with the Baldwin SR-4 Extensonmeter added for accurate control . . . the smaller picture shows how Lockheed obtains the ultimate adhesion strength of a metal-to-metal bond within very accurate tolerances.

Your laboratory, too, will profit by using this unique, versatile testing machine . . . for any of these diverse tests; static tension, compression, flexure, torsion, creep, stress rupture, relaxation, or even shock tests on structures. For the full story on this example of Baldwin's "Packaged Precision Measurement," write us for our new Bulletin 4206. Address: Dept. 2404, Baldwin-Lima-Hamilton Corporation, Philadelphia 42, Pa.



TESTING HEADQUARTERS

BALDWIN-LIMA-HAMILTON

General Offices: Philadelphia 42, Pa. Offices in Principal Cities
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✓OFF SHELF DELIVERY!

✓EXTRA HIGH SAFETY FACTOR!

✓DEPENDABILITY . . . backed by 38 Years of Know-How!

CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
T-J
T-J
T-J
SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

NEW (T-J)

Spacemaker

AIR CYLINDERS

Streamlined design of the new T-J Spacemaker *eliminates tie rods . . . saves up to 40% in mounting space!* It's performance-proved . . . *super rugged* with extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, *hard chrome plated,* seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, *hard chrome plated* piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 454. The Tomkins-Johnson Co., Jackson, Mich.

(T-J) TOMKINS-JOHNSON

RIVETORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHORS

Industry News

(*Continued from page* 182)

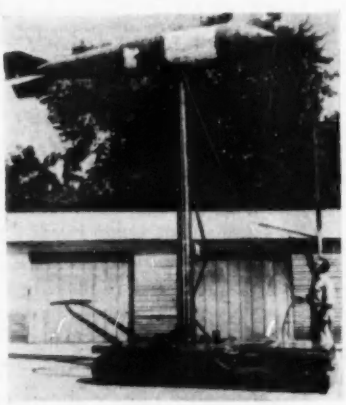
Bomb Lift Incorporates Cone-Drive Gear Sets

Rapid and positive loading of the huge bombs carried by modern military aircraft poses a real materials handling problem. Space and weight limitations in the plane itself make the installation of handling equipment in the bomb bay somewhat impractical. Weight of the bombs is such that manual handling is impractical and dangerous.

To overcome these handling obstacles, Standard Manufacturing Co. has designed and built a compact bomb lift for the Air Force that is said to handle bombs weighing up to 4000 lb. easily. The self-contained unit is motorized to travel from pick-up point to the aircraft waiting line under its own power.

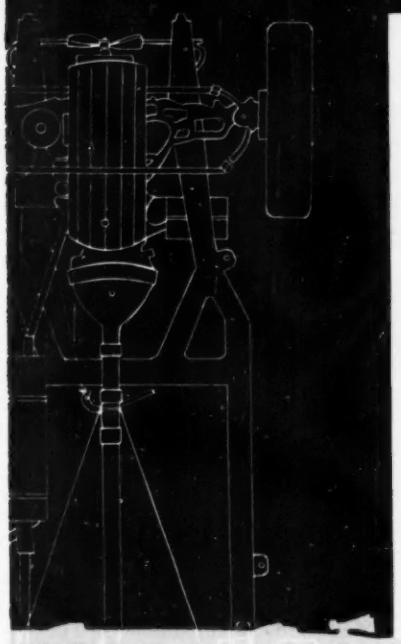
The hoist utilizes two double-enveloping worm gear sets, made by Cone-Drive Gears Div. of Michigan Tool Co., to provide maximum load-carrying capacities while saving valuable space and weight. A powerful general-purpose winch used to drag the bombs from the storage area into lifting position is driven by a five-in. center distance gear set.

A seven-in. center distance Cone-Drive gear set drives initial lift arms that engage the bomb's attaching lugs and elevate the bomb onto the hydraulic table. The telescoping table can rise to approximately 15 ft on its nine-section ram.



Initial lift arms, shown at left of the bomb lift, raise a 4000-lb aerial bomb from the ground onto the telescopic hydraulic ram. Low-slung design keeps the unit stable under heavy loads and facilitates the servicing of squatty jets as well as aircraft standing higher from the ground level.

improved swaging for cable fittings lowers risk of fatigue failures



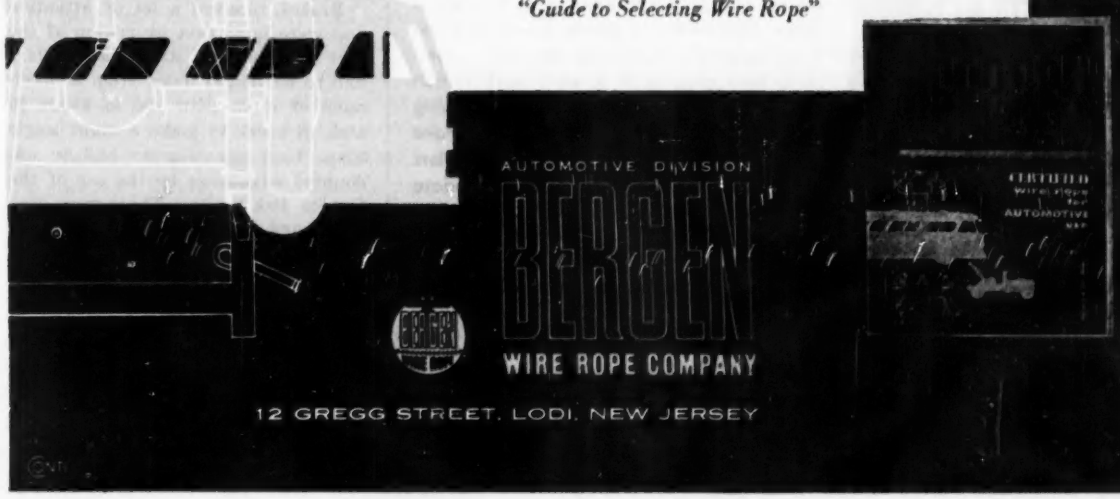
Bergen's new rotary hydroformer reduces internal stresses and fatigue cracks...

An improved machine for swaging fittings to cables has been put in operation by Bergen Wire Rope Company. The fitting shaft is flowed around the cable end by rotary pressure with a minimum disturbance of the grain structure. Internal stresses and fatigue cracks are substantially reduced over conventional swaging methods and perfect alignment of the fitting and cable are assured. The full rated strength of the cable is thus available and the fitting made more durable.

Bergen Wire Rope Company has been meeting requirements of automotive manufacturers for many years. Bergen automotive cables, assemblies and slings have proved their dependability during millions of service hours under every possible operating condition.

For maximum strength and dependability specify BERGEN

Send today for Bergen's "Guide to Selecting Wire Rope"



Rain Fails to Slow Le Mans 24-Hour Race

Le Mans, France

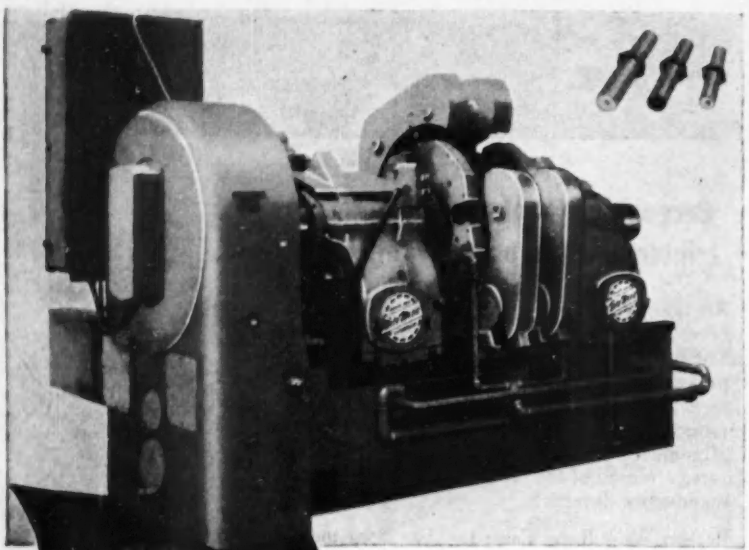
By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

PROOF of the increased speed possibilities of modern sports cars was afforded by an average of 105.16 mph in the gruelling 24-hour race at Le Mans last month. Despite continuous heavy rain, this was only slightly lower than last year's record of 105.84 mph. It was attained by a 302.1 cu in. 12 cylinder Ferrari, driven by Gonzoles and Marzotto. A new six cylinder Jaguar, last year's winner, secured second place with an average of 105.03 mph. A Cunningham came in third with a distance of 2367.37 miles. Of 58 starters, only 18 survived the two rounds of the clock. Briggs S. Cunningham represented the United States with two Chrysler-engined models, which finished third and fifth and a modified Ferrari which was forced out with a broken rear end after having run several hours on 11 cylinders. While this race was for production models, it was not a stock car race in the American sense, for certain modifications were allowed and prototypes were admitted. Lancia, Mercedes and Austin Healy were entered but withdrew, the two former stating that they were not ready and the last named protesting the rules.

Cunningham's cars, with the 334 cu in. Chrysler V-8 engine, were essentially similar to those of last year. The carburetor system, however, was entirely changed by the adoption of four Solex dual downdraft units of a new type. Another change was the adoption of Marchal headlamps and fog lamps in place of the original American equipment. The solid front axle used on one of the cars last year was dropped in favor of independent suspension by support arms and coil springs.

The Ferrari owned by Cunningham was equipped with a system of water-cooled brakes devised by Roy Sanford, of Waterbury, Conn. No information was given out regarding their construction and all that could be learned was that two pumps driven off the end of the camshafts assured circulation of the liquid. Two radiators were mounted in the front fenders above the headlights for the cooling fluid. The device had not previously been used in a speed contest and the Le Mans race did not give an opportunity of judging its possibilities.

Brakes received a lot of attention and were important by reason of the fact that on the straightaway cars had to be slowed down from a maximum of more than 150 to about 40 mph in order to make a right angle turn. Last year Jaguar had an undoubted advantage by the use of the Dunlop disk brakes. These were used again and were not supplied to any other firm. For the first time, Dunlop supplied an aluminum alloy disk wheel having a steel center to mount on five studs, a pressed disk and a rim formed by extrusion, disk and rim being welded together. Weight of a 16-in. rim wheel was stated to be 14½ lb. A Gordini car used disk brakes manufactured by the French Meissier Co. All others used drums, generally

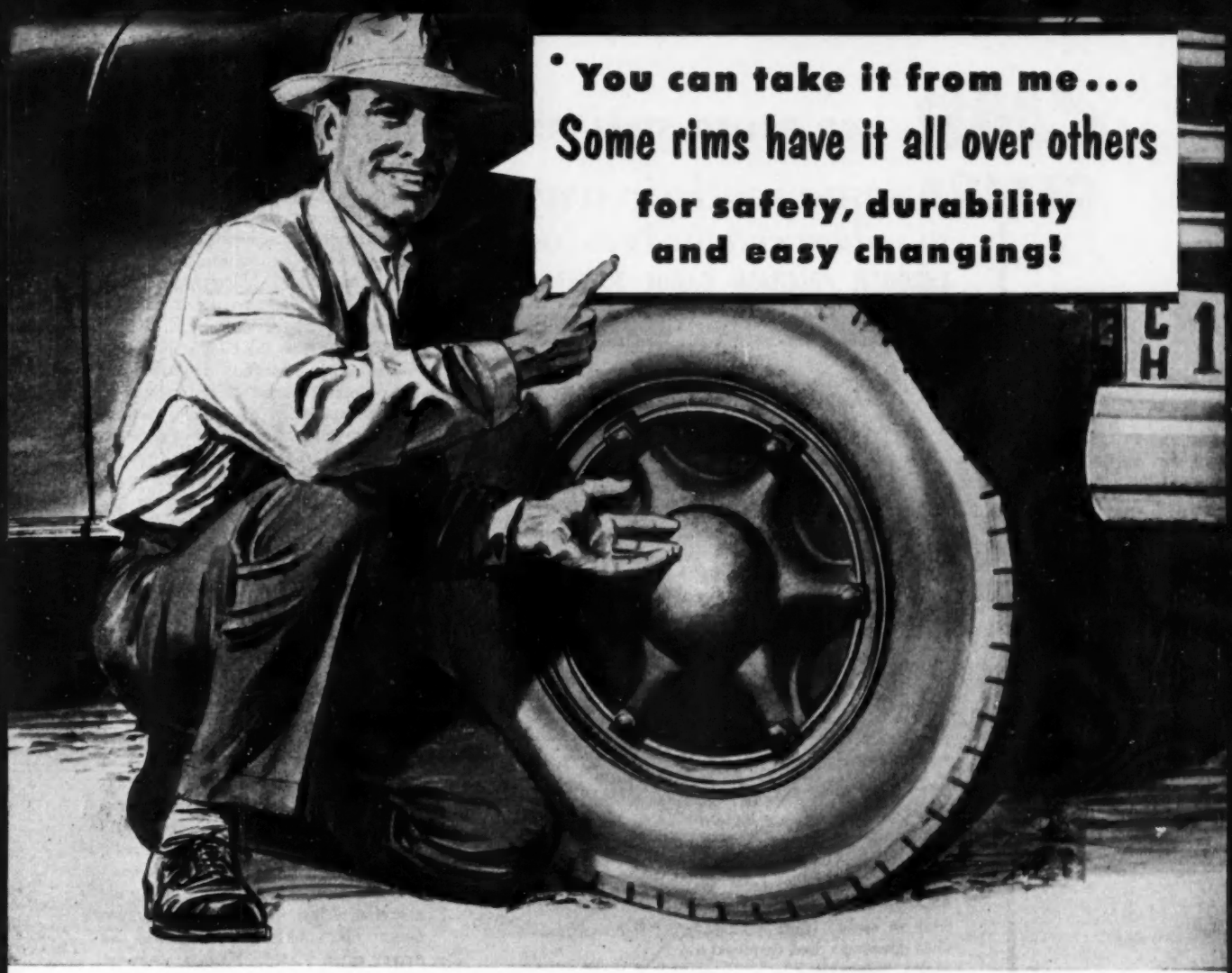


Milling and Centering Simultaneously and in Continuous Production

Here's an excellent example of how two entirely different operations can be combined on one machine. This Davis and Thompson continuous type Roto-Matic both mills and centers on both ends in one operation. Rough and finish milling cuts on the ends of the shaft and centering of both ends is completed with only one rotation of the fixture drum. The centering heads travel with the work station until centering operation is complete then drop back to next work station and repeat. Automatic equalizing clamping is provided to the fixture. Spindles have micrometric adjustment and spindle carriers are adjustable on the ways to accommodate shafts of various lengths.

FREE DATA on this and other Davis and Thompson machines is available in our bulletin No. 1000.

Roto-Matic
Davis and Thompson Co.
4460 N. 124th ST. MILWAUKEE 16, WISCONSIN



No one appreciates the superiority of Cleve-Weld truck and tractor rims more than the man who works with them. He knows that, although different makes of rims are interchangeable, they are *not alike!*

For example, there's added safety designed into Cleve-Weld's popular 3-piece, wide-base rim for trucks and trailers. Its split lock-ring is securely held in its groove by the endless side flange so that it just can't fly off!

Cleve-Weld metallurgists have produced a lightweight rim engineered to provide extra strength at points where stresses and strains are greatest. All Cleve-Weld rims are of full wide-base design with tapered bead seats, smooth flange contours, and close-fitting, interchangeable parts that facilitate tire changing.

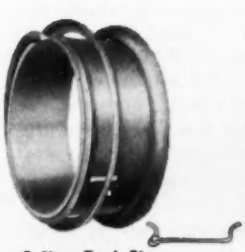
Many manufacturers of trucks, trailers and farm implements use Cleve-Weld rims as original equipment. You, too, may find it very worthwhile to get Cleve-Weld's catalog and prices. Write THE CLEVELAND WELDING COMPANY, West 117th Street & Berea Road, Cleveland 7, Ohio. (A subsidiary of American Machine & Foundry Company, New York)

products are better...*by design*

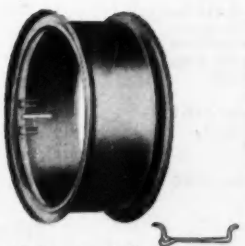
CLEVE-WELD®

PROTECTO-TIRE RIMS

made better...to last longer



3-Piece Truck Rim

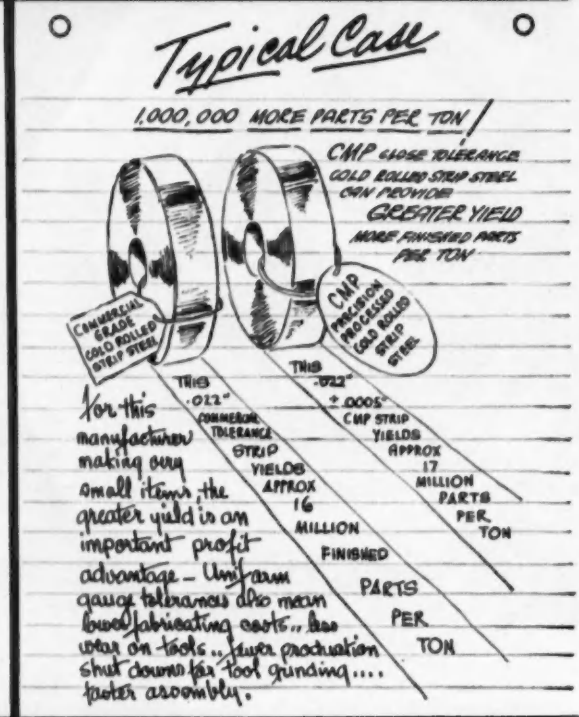


2-Piece Truck Rim

Deep-Well, Drop-Center Tractor Rims

Wide-Base, Attached-Clamp Tractor Rims

CMP COLD ROLLED STRIP STEEL OFFERS *some realistic ways to reduce end-product costs* THROUGH PRECISION GAUGE TOLERANCES


Typical Case
1,000,000 MORE PARTS PER TON!
CMP CLOSE TOLERANCE COLD ROLLED STRIP STEEL CAN PROVIDE GREATER YIELD MORE FINISHED PARTS PER TON
COMMERCIAL GRADE COLD ROLLED STRIP STEEL
CMP PRECISION PROCESSED COLD ROLLED STRIP STEEL
THIS .022" COMMERCIAL TOLERANCE STRIP YIELDS APPROX 16 MILLION FINISHED PARTS PER TON
THIS .022" ± .0005" CMP STRIP YIELDS APPROX 17 MILLION PARTS PER TON
For this manufacturer making very small items, the greater yield is an important profit advantage – Uniform gauge tolerances also mean lower fabricating costs, less wear on tools, fewer production shut downs for tool grinding.... faster assembly.

Having ear trouble? If your drawn product requires trimming to remove ears or scallops, you may be able to reduce your end-product cost by the use of CMP non-earing (non-scalloping) cold rolled strip steel. This is one of many ways in which CMP engineers specifications and processing methods to enable strip steel users to produce better products at lower cost.

Perhaps we can help you to reduce end-product cost without capital investment.

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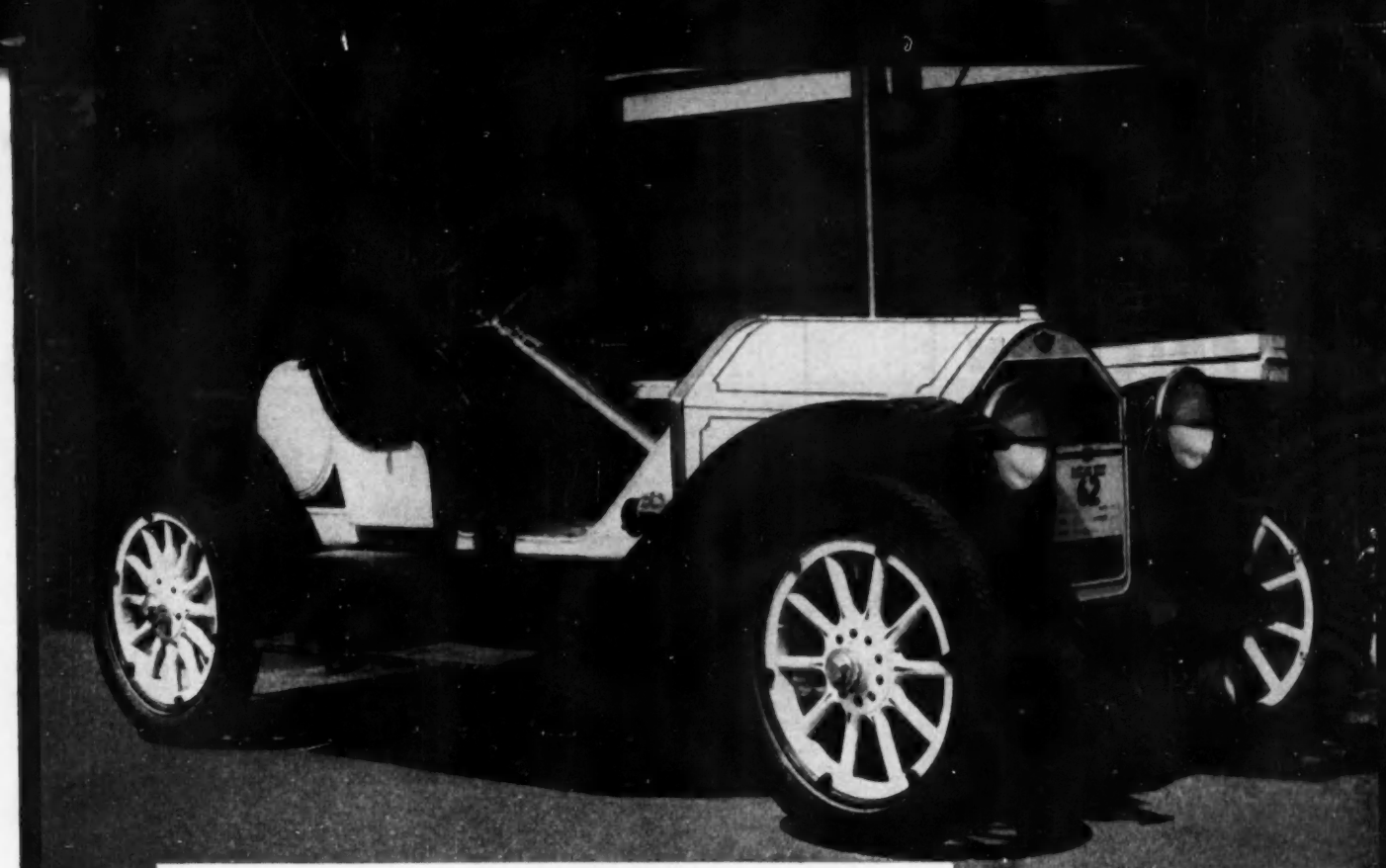
light alloy castings with inserted liners. In the move towards streamlining it has been found necessary to provide for air ducting to the drums.

Streamlining received more attention than ever and was particularly outstanding on the small cars. In this connection it is significant that open models were in the majority and many were the work of prominent aviation engineers. Bristol had a closed body with double fins, the body itself being placed so far back that the driver was only slightly ahead of the rear axle. Jaguar had open bodies designed by Malcolm Sayer, a well known aviation engineer, a feature of which was a driver's head rest fairing into a fin. With right-hand steering, this fin was offset from the longitudinal axis of the car. Some of the small French cars provided excellent examples of scientific streamlining, notable among them being the flat-twin Panhards which had an airplane wing type body designed by engineer Riffart. The low height of the engine assisted in reducing head resistance, and from a shallow slot on the entering edge air was ducted to each of the cylinder barrels. There were two schools in the treatment of the small rear engine Renaults, one inclining the radiator and putting it at the front, and the other carrying it at the rear, behind the engine and fairing the hood into the driver's head rest. This gave a low entering edge and a maximum height just equal to the height of the driver when seated. From a scoop on each side of the hood air was ducted to the radiator and discharged rearwards without passing over the engine. Although two seats were required, the second seat not necessarily occupied. These small cars had central steering, but were able to dispose of enough room by the side of the driver to meet the minimum requirements for passenger space. Another feature which was common was to recess the headlights some considerable distance back in the fenders and to cover over the opening with transparent plastic to give an unbroken line.

Only one car came to the line with a plastic body—the English Kieft, whose lines were quite conventional.

The was considerable interest in the new Jaguar models. This firm won last year and it was expected that the new cars would provide all the competition against the Italian Ferraris. This belief was justified, and although the 12 cylinder, 302.1 cu in. Ferraris had a rather higher maximum speed than the six-cylinder 210 cu in. Jaguars, four out of the five Italian cars were stopped by mechani-



SEND FOR FREE PRINT

The Bearcat—one of the very few true sports cars built in this country. This 1916 Stutz Series E Bearcat had a top speed of 80 mph, a demoniac speed back in 1916. It had a Wisconsin T-Head four cylinder engine of 4¾ x 5½ bore and stroke, rated at 36.1 hp but developing over 60 hp at only 1500 rpm.

This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy, suitable for framing.

Proved dependability keynotes Morse Timing Chain Drives

Of the cars now using timing chain drives, twelve out of sixteen—or 74% of those produced, use Morse Timing Chain Drives as original equipment.

Morse is the leading maker of mass-produced, precision-made timing chain drives. Over 58,000,000 of them have given dependable performance in some 116 different makes of cars and trucks.

Rely on Morse for expert engineering service; prompt, on-schedule delivery of parts, too.

Write or call us today. See why it is true that M = TC, Morse means Timing Chains.

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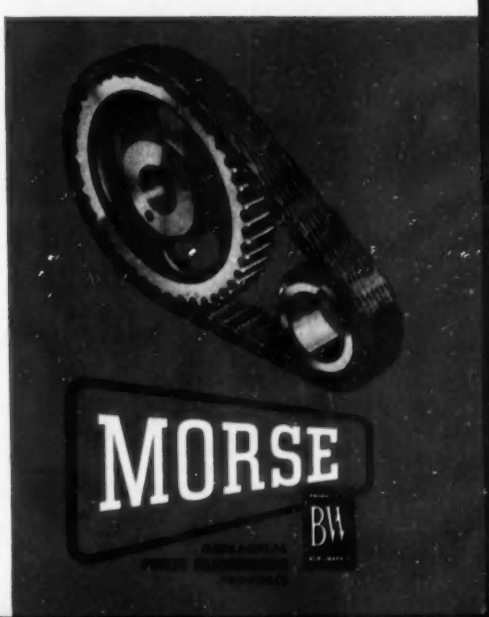
7601 Central Avenue
DETROIT 10, MICHIGAN



M=TC

Morse *means* Timing Chains

Specify...
FRICTION
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drives by...

Twin Disc . . . *pioneer in the power linkage field* . . . offers the widest variety of power linkage for industrial equipment, with *standard* model Friction Clutches for fractional to 1325 hp, and *standard* model Fluid Drives for ¾ to 850 hp. *Applicable to all types motor or engine hook-ups*, through a wide selection of input, output combinations.

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin
Hydraulic Division, Rockford, Illinois

RACE RESULTS

Distances Covered by Cars that Finished

Car	Piston Displacement	Distance (miles)
1. Ferrari	302.1 cu in.	2523.48
	Average 105.16 mph	
2. Jaguar	209.9 cu in.	2520.93
3. Cunningham	334.4 cu in.	2367.37
4. Jaguar	209.9 cu in.	2314.7
5. Cunningham	334.0 cu in.	2288.8
6. Gordini	150.0 cu in.	2202.4
7. Bristol	120.3 cu in.	2178.2
8. Bristol	120.3 cu in.	2153.1
9. Bristol	120.3 cu in.	2135.6
10. D. B. Panhard	45.4 cu in.	2008.4
11. Frazer Nash	120.0 cu in.	1909
12. Porsche	91.5 cu in.	1893.9
13. Panhard Monopole	37.3 cu in.	1856.8
14. Porsche	66.4 cu in.	1803.3
15. Triumph	122.0 cu in.	1793.1
16. D. B. Panhard	45.4 cu in.	1781.5
17. Panhard	37.2 cu in.	1633
18. B. G. Renault	45.5 cu in.	1617.3

cal failures. Of the four Britishers, two failed and two finished.

Developed from the C type, the competition Jaguars have a lot of new chassis, engine and body features. The engine has a bore and stroke of 3.21 by 4.21 in., a seven-bearing crankshaft and two overhead camshafts, and in the race ran with a compression ratio of 9 to 1 on the gasoline supplied by the organizers. Output is now 250 hp at 6000 rpm, compared with 220 last year. The engine is inclined eight degrees from vertical in order to decrease height. Lubrication is now of the dry sump type, which helps to decrease height. The oil tank is carried on a special frame extension under the hood. The oil cooler is set by the side of the radiator, ahead of the engine. Three dual, side-draft Weber carburetors are used; air for these passes through a scoop on the top of the hood and is "boxed" to the carburetor inlets. The frame layout provides for stiffening of the stressed skin magnesium alloy body which has two separate cockpits. The driver has the principal instruments directly in front of him and some subsidiary instruments to his left at an angle of about 40 deg. He is protected by a curved plastic windshield, back as far as his shoulders.

These cars were the only ones in the race with Dunlop disk brakes and the new type Dunlop light alloy wheels. The brakes, which were used very successfully last year, are 12¾ in. diameter and have three pairs of pads at the front and two at the rear. Climatic conditions made braking less strenuous than last year, but the disk type still showed an advantage over drums.

By reason of the new design and light alloys, it has been possible to reduce height from the ground to the top of the cowl to 32 in. and to achieve a weight saving of about 168 lb. Wheelbase is 90 in. and front tread 50 in.; overall length is 154 in. and width 65¼ in.

The David Brown organization presented, in addition to four Aston Martin models, a new 12-cylinder Lagonda of 270 cu in. piston displacement which is said to develop 300 hp at 6000 rpm. The cylinder block is an aluminum casting with wet liners, the crankcase a barrel type with seven main bearings, and the four overhead camshafts are chain driven. This engine has dual ignition with 24 plugs of 10 mm and three quadruple Weber carburetors. Weight of this model, with an open body, is 2250 lb.

Two of the Aston Martins, running with closed bodies, were new types with light alloy cylinder heads and dual ignition. With a piston displacement of 178 cu. in., these engines are said to develop 200 hp at 5500 rpm. A De Dion type axle was used, with outboard brakes, and a feature was an air scoop on the hood, delivering air through a large diameter rubber hose direct to the differential housing. This hose made the passenger's seat practically useless, but it was accepted by the organizers. One of the six-cylinder

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Aston Martins used a Wade supercharger, shaft and chain driven from the crankshaft, giving a boost of 10 psi. Its engine was stated to develop 250 hp.

Bristol's 450 model, with a six-cylinder engine of 120.3 cu in. piston displacement, was an improvement on last year's entry, with the same general type of closed body, refined as the result of further wind tunnel tests. Retaining the two fins, which are its outstanding external feature, the depth of the channel between them has been reduced to eliminate certain disturbances which had been detected. The engine with a 9¼ to 1 compression ratio, is stated to have greater power than last year's type. Three dual Solex downdraft carburetors supplied the mixture. Chassis frame construction featured steel tubes with big diameter side rails and four tubular cross members. The closed body employed steel tubes for framing with light alloy paneling. Another feature was light alloy combined brake drums and wheel spider, the light alloy rim having five lugs for attachment to the five "spokes" of the wheel.

While the fastest of these cars finished seventh, averaging 90.7 mph, the Bristols were the only team of three to go the distance, thus winning the team prize.

A newcomer was the small Kieft, equipped with a four-cylinder Coventry Climax engine of 67 cu in. piston displacement used for the first time in a Continental race. Specially designed for competition work, this light alloy, overhead valve unit was stated to develop 74 hp at 6000 rpm, with a compression ratio of 8.6 to 1. The chassis featured a tubular frame with a De Dion type rear axle and leaf spring suspension, and independent suspension in front. Interest was in the two-passenger plastic body with a weight of 65 lb. A second car of the same make had an M.G. engine. Indifferently streamlined in comparison with the others, both cars failed to go the distance.

The new Porsche cars, based on the Volkswagen, attracted a lot of attention but did not live up to expectations in the race. The aircooled, 91½ cu in. flat four known as the 550, has overhead camshafts and four Solex downdraft carburetors. It was run with a compression ratio of 9 to 1 and was stated to develop 120 hp. The crankshaft is carried on four roller bearings and rollers are used also for the connecting rods. All chassis frame members are tubular. The hood is hinged at the rear and forms one part with the fenders. All four wheels are independently sprung, with circular torsion bars at the rear and leaf torsion bars at the front. With a light alloy, two-passenger body, the Porsche cars weighed 1210 lb.

On a formula basis the 24-hour race was won by a D. B. Panhard, equipped with an aircooled, 45.4 cu in. Panhard flat twin. On a distance basis this car was placed tenth, with an average speed of 83.68 mph, thus beating the old record for this class of car. Basically the engine is the standard Panhard with opposed aircooled cylinders, with roller bearings for crankshaft and connecting rods and torsion bars for valve operation. A feature was the use of a dual Solex carburetor for each cylinder, giving the equivalent of two carburetors per cylinder. Headlights were set into the fenders, behind transparent plastic which did not break the smooth line of the body. With all the mechanism in front, it was an easier matter to obtain a completely flat underpan.

The record for one lap was raised by the winning Ferrari to an average of 117.7 mph, while over the flying kilometer on the fast backstretch speeds of 173 mph were recorded.

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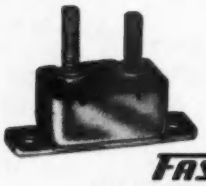

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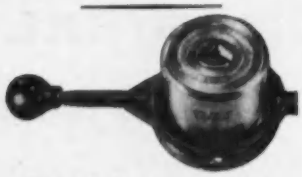

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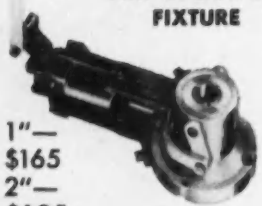

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METALS AND HOW TO WELD THEM, *by T. B. Jefferson and Gorham Woods, published by the James F. Lincoln Arc Welding Foundation, Cleveland 17, O. Price, $2.00.* This volume is a combination text and reference book to give all users of welding a practical work knowledge and source of information for designing and making better welds at lower cost. It has been organized and written to explain in clear, logical, readily understood steps, the structure and properties of metals and how to weld them. The first six chapters are devoted to elementary discussion of metals, their mechanical and physical properties and uses. The fundamentals of metallurgy and their significance in heat treating and welding are explained in logical steps. This information is then related to correct welding procedures for steels, cast iron, nonferrous materials and hardfacing. All commonly used types of metals are covered. The final section of the book is devoted to information for making good welds, trouble shooting, cost estimating, and explanation of welding terms.

THE SKILLED LABOR FORCE, *published by U. S. Dept. of Labor, copies available from Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, $0.45.* Included in the publication is information concerning the distribution of craftsmen by industry, trade, and locality; their ages and educational background; their income and status; the numerical relationship of craftsmen to the population; and trends in the growth of the various crafts during the past 50 years Prepared by the Labor Department's Bureau of Apprenticeship, the booklet is based on material contained in statistical volumes published by the Census Bureau over five decades.

REPORT ON THE PRINCIPLES INVOLVED IN THE DETERMINATION OF ABSOLUTE VISCOSITY, *published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price, $1.00.* The purpose of this report was to encourage the recognition and use of instruments yielding results in standardized units having true physical dimensions that will convey the same meaning in all laboratories. While not to be considered a laboratory manual, but rather an introduction to rheology from a practical point of view resting on a sound theoretical base, this book will prove a valuable assets to those concerned with viscosity determination.

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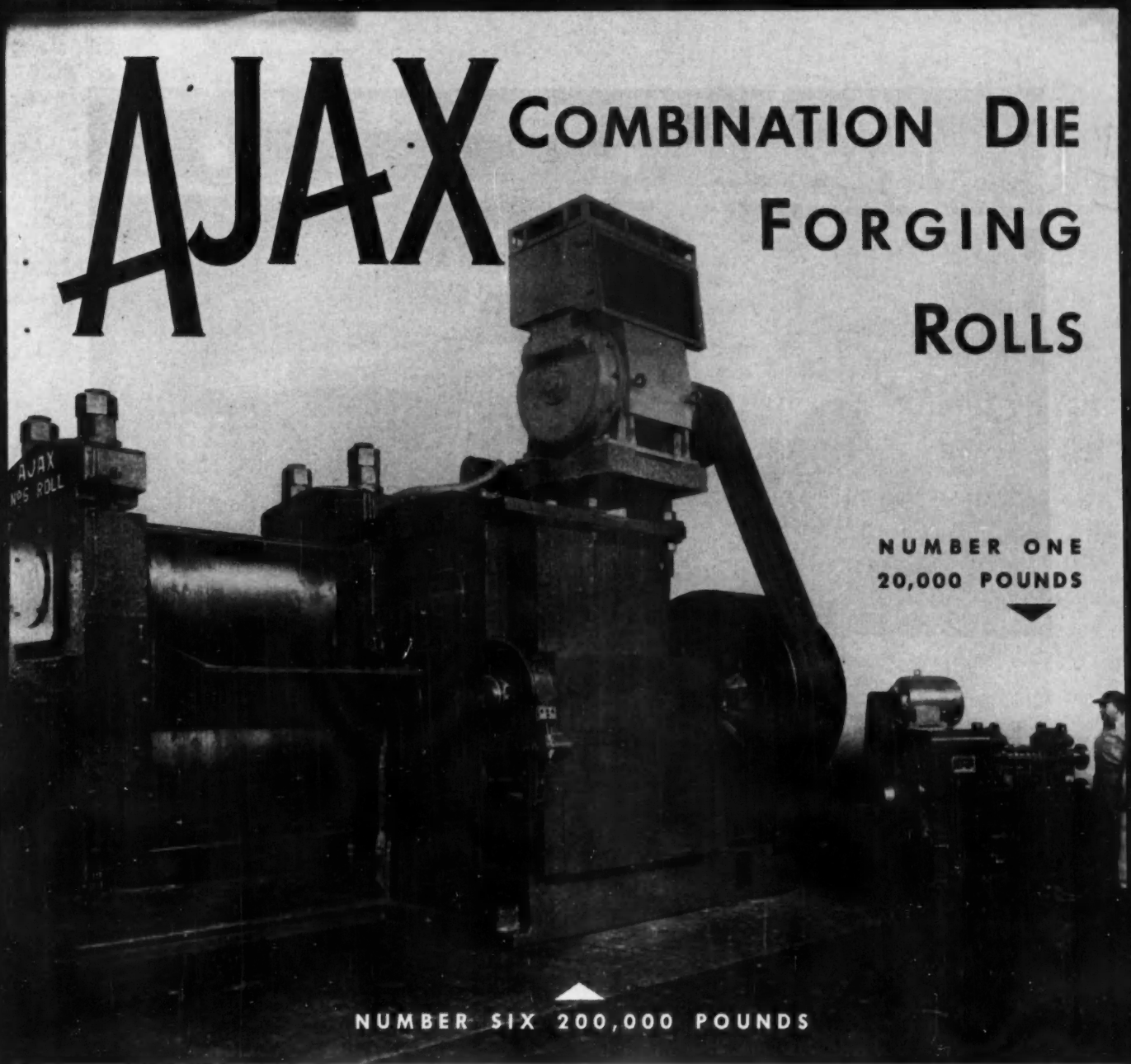

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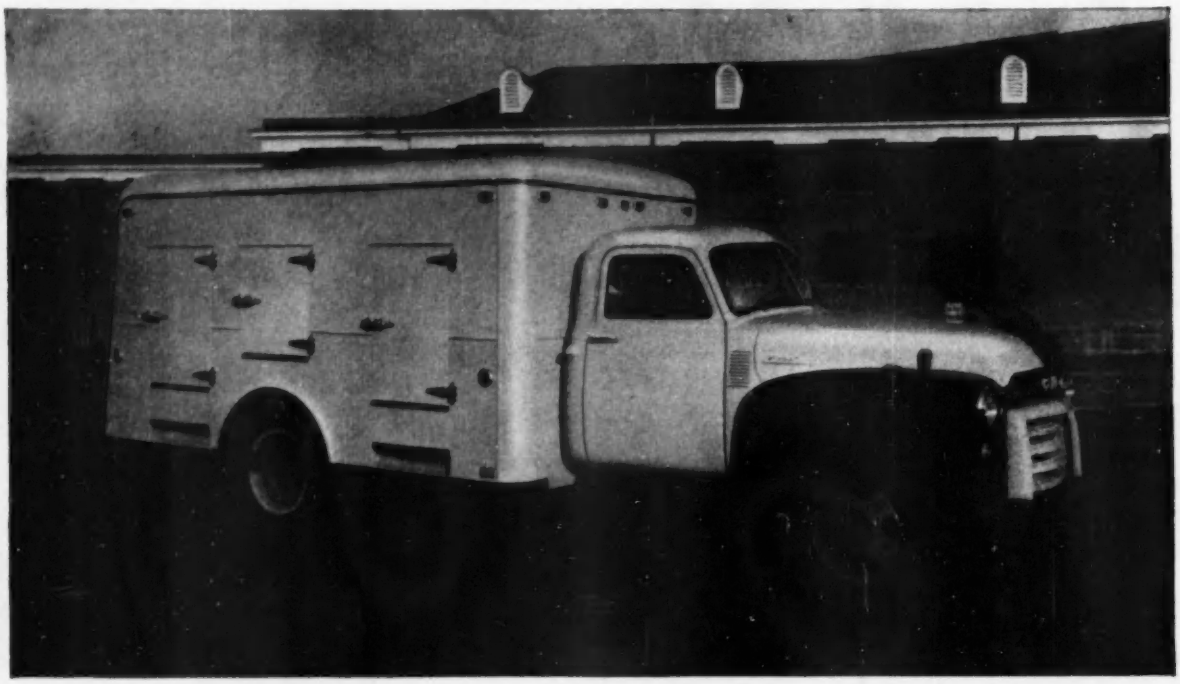

Hackney-built refrigerator body, with Mayari R corner posts. The need for replacement corners dropped noticeably when Mayari R was put in.

How Hackney Bros. uses Mayari R as a "double-edged tool"

Just 100 years ago, W. N. Hackney opened up shop in Wilson, N. C., to make wheels and other parts for wagons and buggies. Today, three generations later, Hackney Bros. Body Co. is the thriving builder of bodies for commercial vehicles like the ice cream truck shown above.

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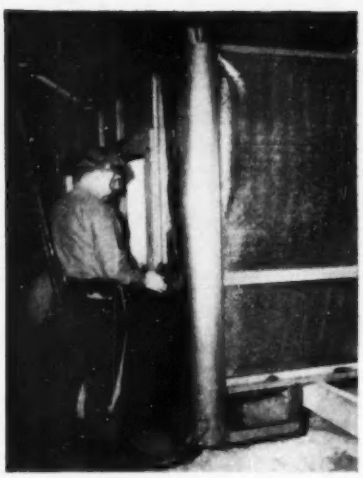

Construction view showing corner post made of Mayari R that has been welded in place. This refrigerator body is lined with Bethcon continuously galvanized sheets.

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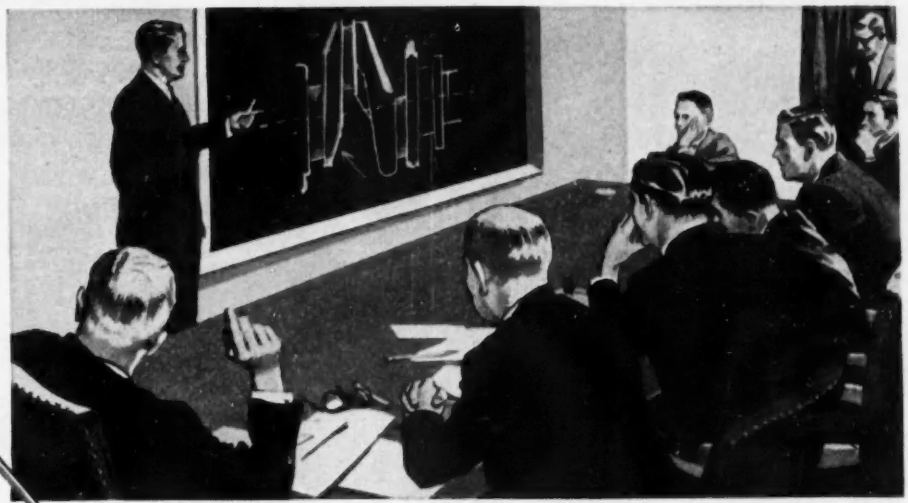

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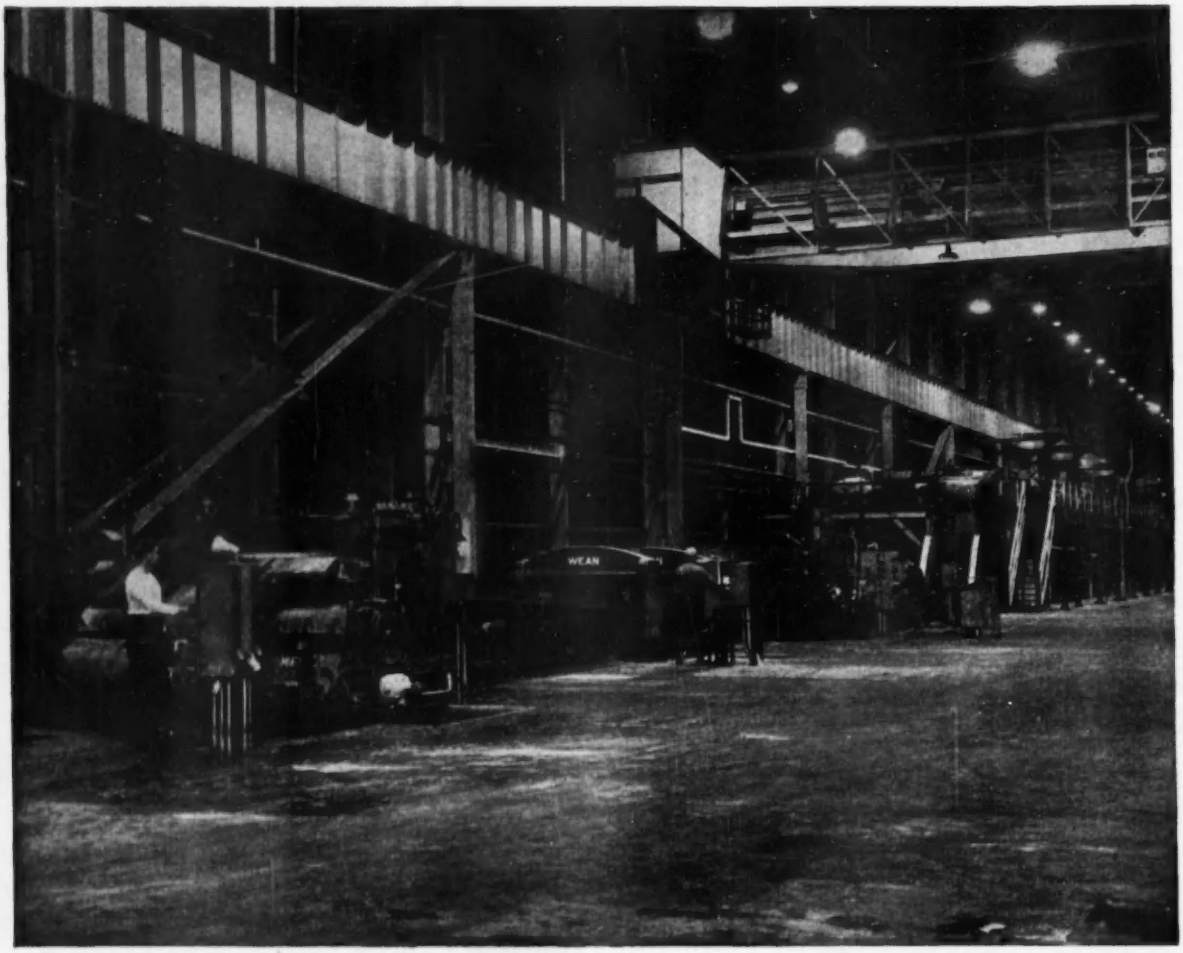

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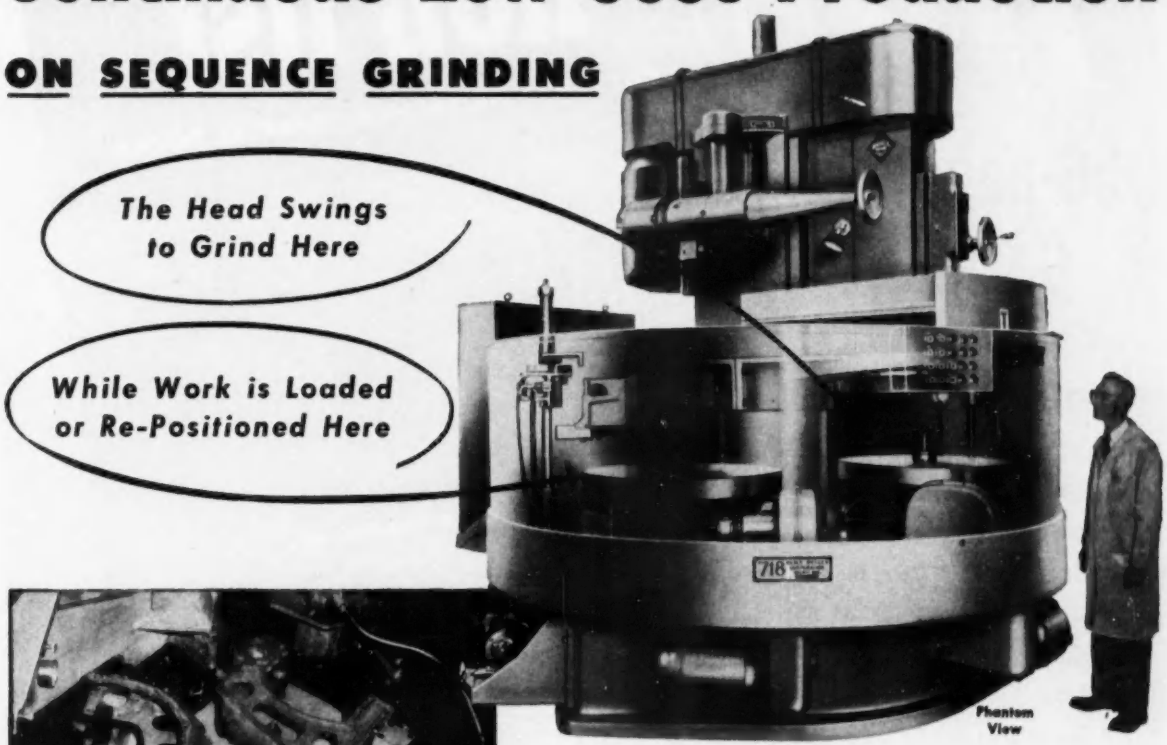

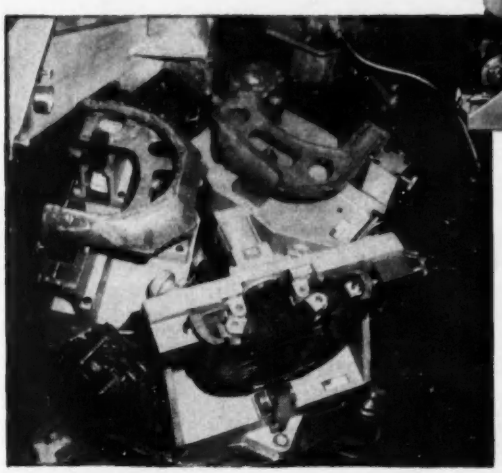

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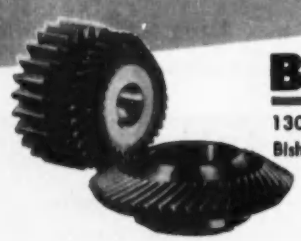

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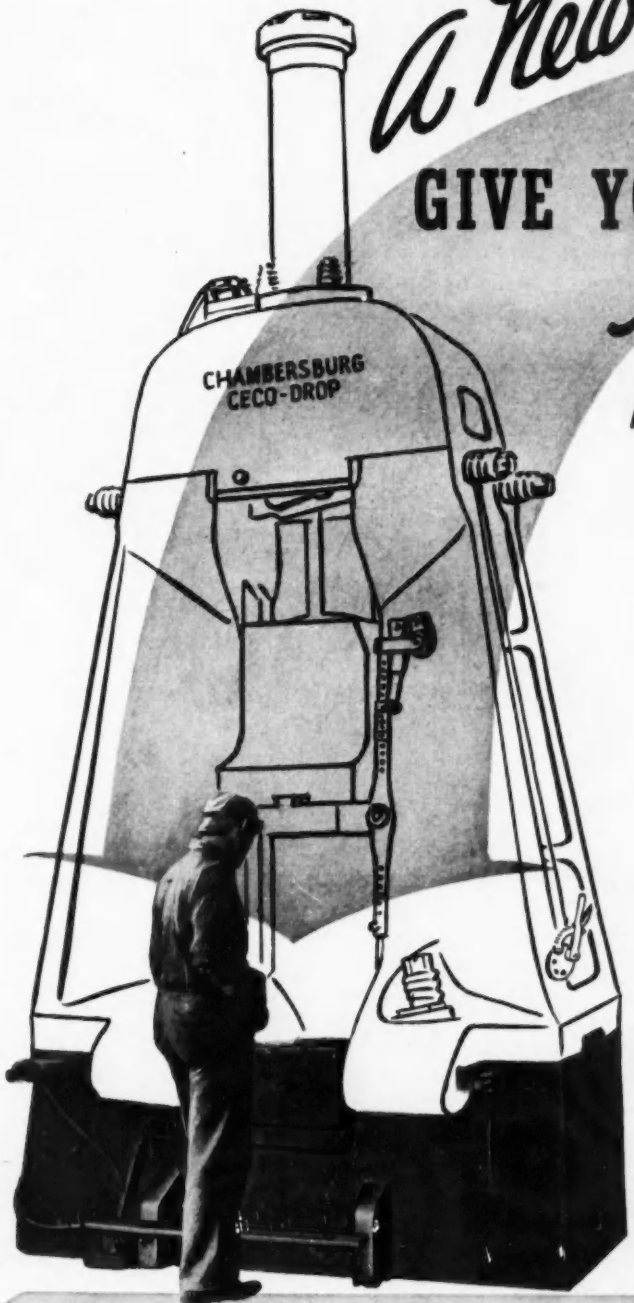

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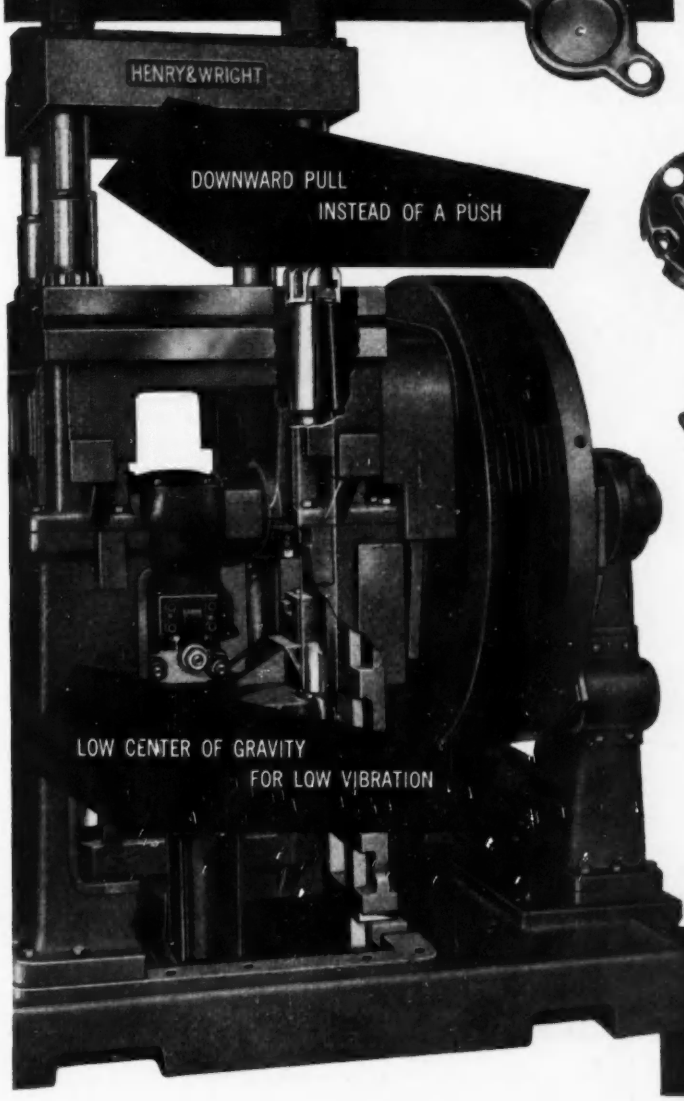


Henry & Wrights are making production runs that designers never had dreamed could be stamped at a profit. Our representative would like to show you some of the pieces.

Please write to Henry & Wright, 491 Windsor Street, Hartford, Connecticut.

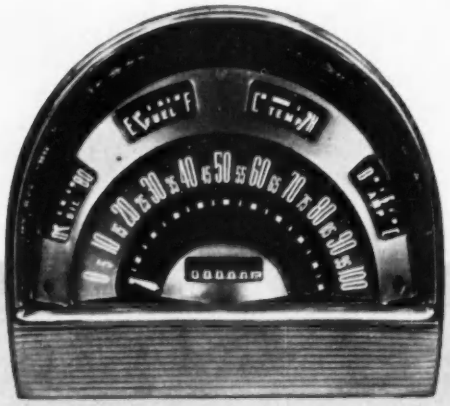
H&W®

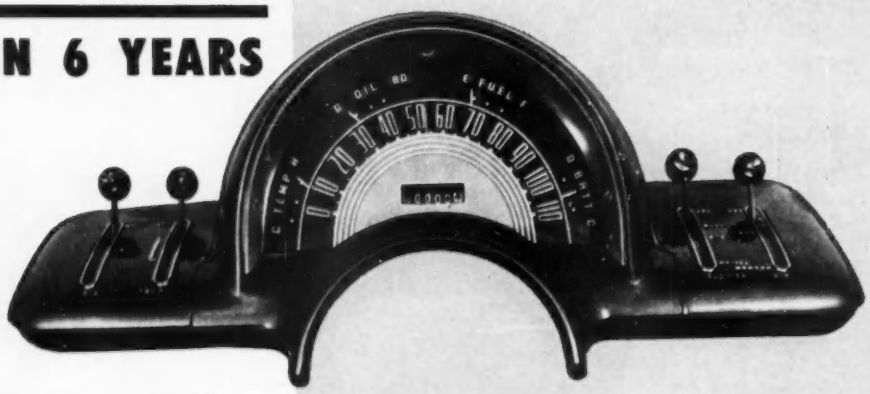
HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

HARTFORD, CONNECTICUT

DEMAND FOR KS SPEEDOMETER UP 160% IN 6 YEARS





Early in 1948 King-Seeley completed the development and testing of a new speedometer design using a Cunife magnet. King-Seeley adopted this magnet material because of its inherent stability and imperviousness to shock, vibration, temperature variations and stray magnetic fields.

The general acceptance of this new design has been more than gratifying. Production has increased 160 per cent since its adoption and three new accounts have been added to the list of original equipment users.

This is the automotive industry's recognition of an instrument that has won the car owner's complete approval.

KING-SEELEY CORPORATION
ANN ARBOR, MICHIGAN
Plants at ANN ARBOR, SCIO and YPSILANTI

6611

AEROQUIP HOSE LINES with Detachable, Reusable Fittings

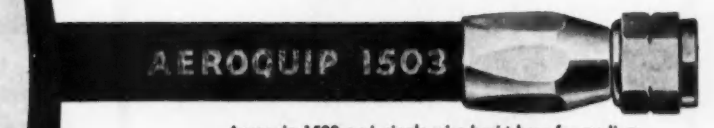
Solve Design Problems

Extreme heat, cold, vibration, installation complexities, and other fluid line problems can be solved readily by the application of Aeroquip flexible hose lines. A variety of hose line types in a wide range of sizes and burst pressures meet every industrial need.

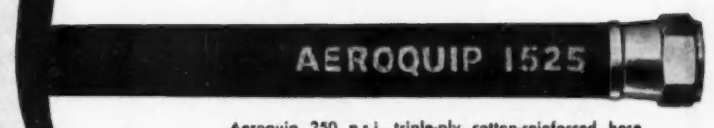
Aeroquip hose assemblies can be made right in your plant, *in minutes*, by cutting bulk hose to length and attaching the reusable fittings. An inventory of bulk stock permits the making of individual hose lines for mock up installations or thousands of hose lines for production runs.

Write for complete hose line information. If you want help on a specific problem, a qualified Aeroquip sales engineer will arrange a call.

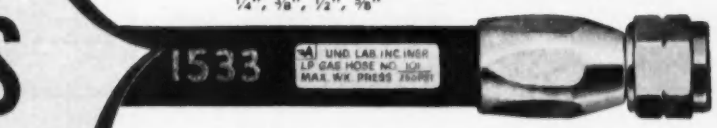
Aeroquip double wire braid hose for high pressure hydraulic, hot oil, grease, crude and fuel oil, gasoline, and air lines. Pressures range from 5000 p.s.i. in ¼" size to 1000 p.s.i. in 2" size.



Aeroquip 1500 p.s.i. single wire braid hose for medium pressure hydraulic, water, hot oil, crude and fuel oil, anti-freeze solution, gasoline, diesel fuel, and air lines. ¼" to ¾".



Aeroquip 250 p.s.i. triple-ply cotton-reinforced hose with one-piece SOCKETLESS fittings for low pressure hydraulic, water, hot oil, crude and fuel oil, anti-freeze solution, gasoline, diesel fuel, vacuum and air lines. ¼", ⅜", ½", ⅝"



Aeroquip wire-braid-reinforced butane-propane hose for LPG engine plumbing or for fixed installations where vibration causes problems. This is the only butane-propane hose line listed by the underwriters' laboratories. ¼" to 2".

Aeroquip burstproof hose with *"little gem"* fittings for steam cleaning units, dry cleaning and pressing equipment, foundry equipment, plastic molding presses, steam boiler installations, rubber curing and vulcanizing equipment. ½" to 1".

Aeroquip Freon hose for use on automotive and commercial air conditioning units and refrigeration equipment using Freon 12. Sizes are ¼" to 2".

"little gem" is an Aeroquip Trademark

Aeroquip
REG TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

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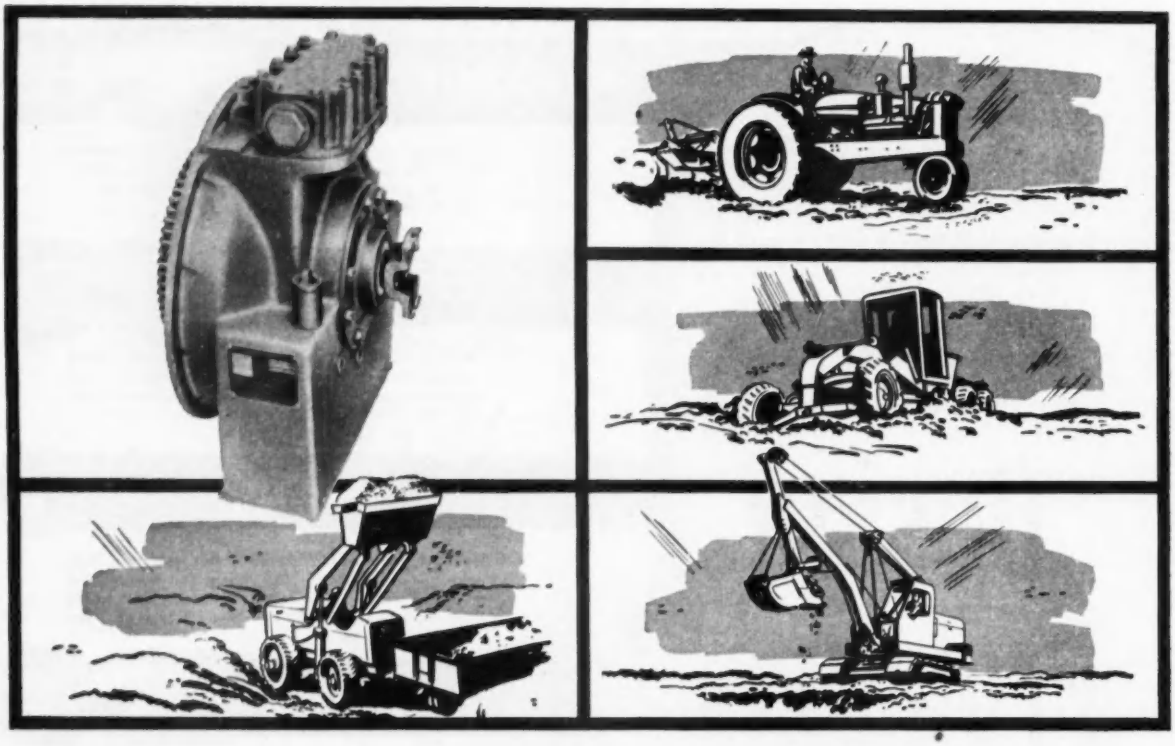
AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD



NEW TORQMATIC CONVERTERS FOR GASOLINE-OR DIESEL-POWERED EQUIPMENT

• EASY TO INSTALL
• COMPACT
• LOW-COST

YOUR 40- to 150-horsepower industrial and automotive engines and equipment will last longer, perform better, with a low-cost heavy-duty Allison TORQMATIC Converter protecting engines and drive lines from harmful shock loads.

And manufacturers now are offering this shock-free power transmission in their models with little or no change in equipment design.

The new Series 200-300 TORQMATIC Converters *are priced to compete* with converters designed primarily for passenger cars—*sell for less than* most comparable industrial units.

And the new *completely self-contained* TORQMATIC Converters take up little more space than conventional clutch power take-offs—have standard SAE #3 engine mountings to fit any gasoline or Diesel engine in their range.

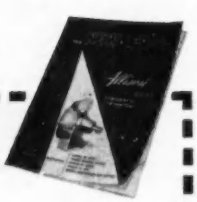
Many options, including front disconnect clutch and adapter, rear disconnect clutch adapter, standard flange, industrial shaft with or without governor drive, permit installation in a wide range of hard-working units. For full details on how easy TORQMATIC Converters are to install in your equipment, ask your equipment dealer, manufacturer or fill in the coupon and mail to:

Allison Division of General Motors
Box 894A, Indianapolis 6, Indiana

GM GENERAL MOTORS

Allison

TORQMATIC DRIVES



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Modern Machine Tools..

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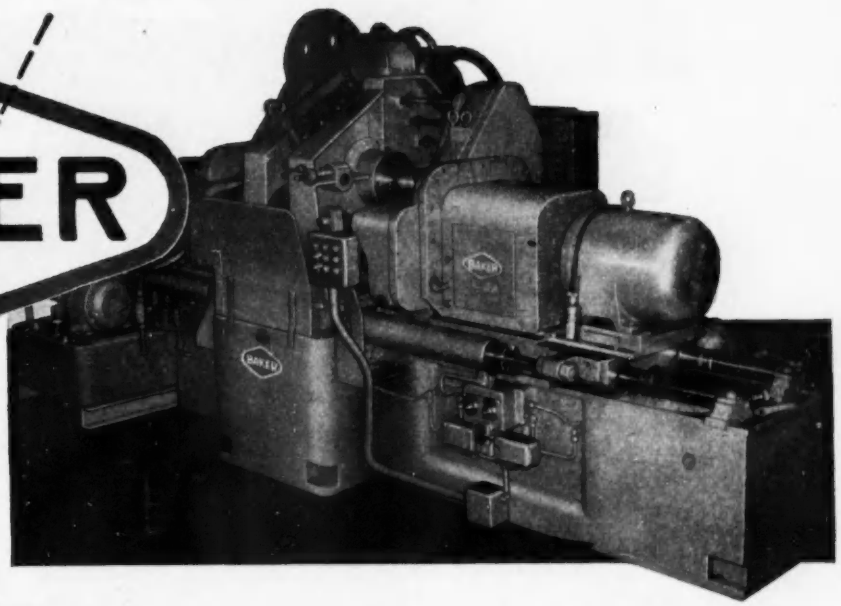
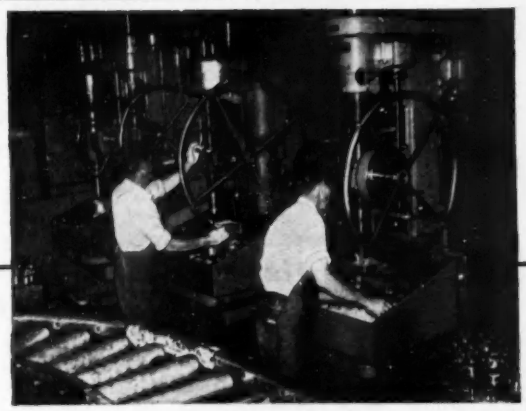
New BAKER Method



1 Operator . . .
1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload

THE OLD METHOD —



2 OPERATORS . . 4 MACHINES . .

Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

INCREASE PRODUCTIVITY.. with a NEW BAKER 'Special'

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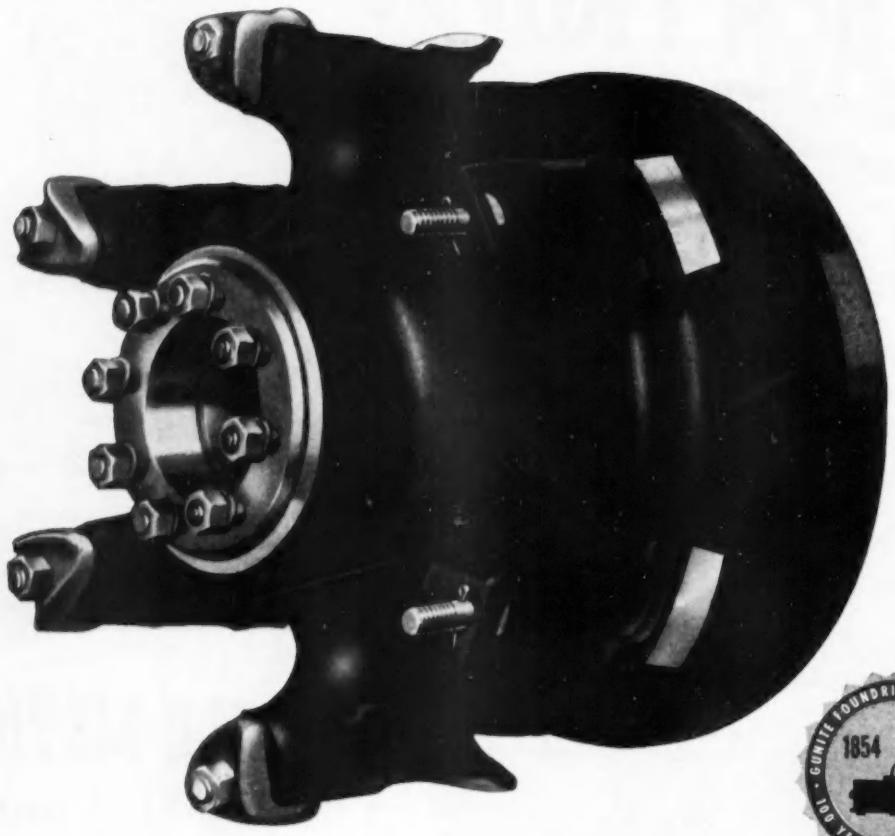

for highway trucks and trailers

Assure yourself of minimum wheel and tire assembly time by using GUNITE Wheel Assemblies. Tire mounting requires no special tools . . . is quick, easy and simple. Six floating lug bolts firmly lock dual tires on the wheel. The stronger, lighter tubular-spoke of GUNITE design brings you a more efficient wheel with the proven strength of cast electric-steel. Write for complete information on GUNITE Wheels.

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GUNITE operates three ferrous foundries under one roof:

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Thus GUNITE can provide the best cast ferrous material to suit your requirements.

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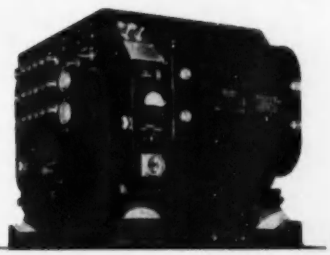
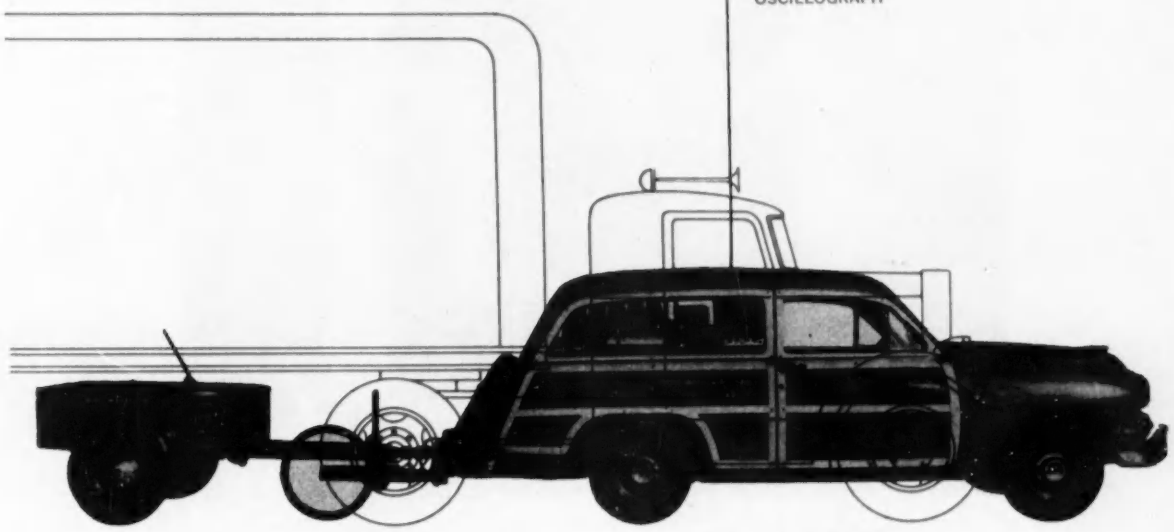
For product acceptance tomorrow evaluate performance today

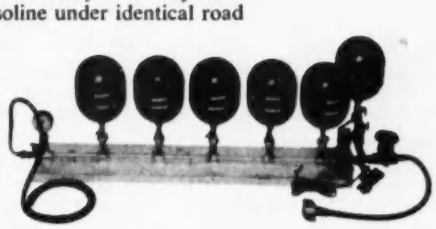


CONSOLIDATED
RECORDING
OSCILLOGRAPH



BORG-WARNER RESEARCH TEST CAR

Truck, bus and tractor operators who use liquid petroleum gas for fuel want the best in gas control equipment. Borg-Warner research engineers carry on hundreds of field tests, checking the efficiency of fuel systems to compare the performance of LPG and gasoline under identical road and weather conditions. The basic instrument in the BW test car, a 9-channel Consolidated recording oscillograph, proved itself by 14 months and 5,000 miles of all-season service. Unaffected by weather or vibration, this rugged, reliable instrument recorded such forces as car speed, time in hundredth seconds, distance in ten foot intervals, engine fire feed-in, gas torque pressure, engine vacuum and acceleration. Accurate product evaluation by CEC dynamic recording instrumentation eliminates guesswork in the development of new products, cuts manufacturing costs and increases consumer acceptance. Write for CEC Bulletin 1500C-X16.



Manifold used for high-accuracy correlation of fuel consumed to distance traveled in Borg-Warner comparative performance tests.

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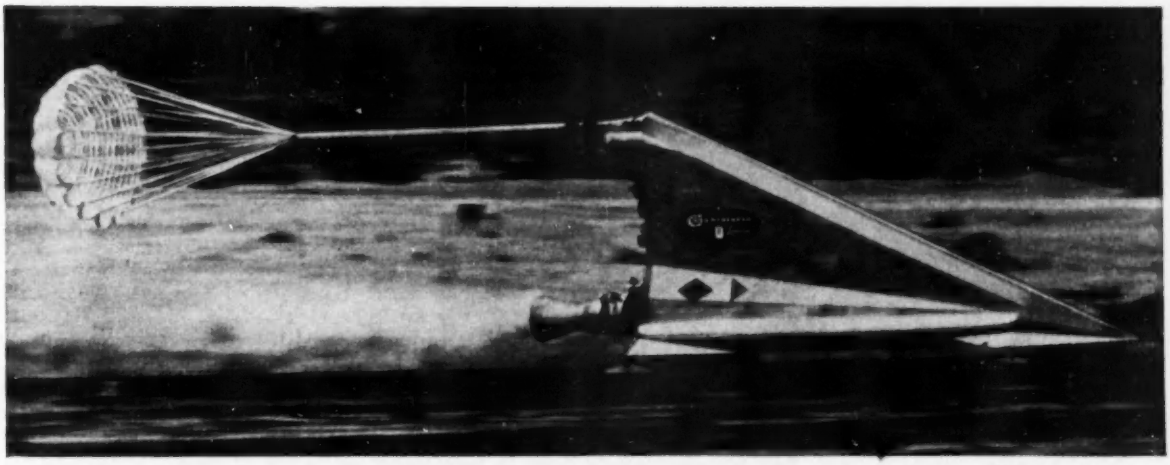
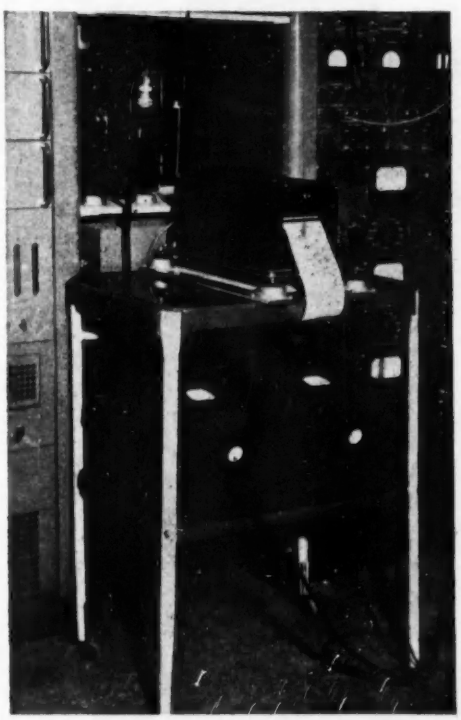


WHOOSH!

CAN THE PARACHUTE TAKE IT?



Brush Amplifiers and Oscillographs provide chart records of test data when tape recordings are "played back." Brush Instruments, which are ruggedly built and portable, provide instantaneous high-speed recording on chart paper.

Brush Instruments give the answers in writing

This rocket-propelled test sled, developed by Cook Research Laboratories, a division of Cook Electric Co., Chicago, roars down the rails at Edwards Air Force Base at speeds up to 1500 miles an hour – then the parachute is opened. The resulting drag, oscillation, strain and many other factors are recorded on magnetic tape to help engineers develop more efficient parachute designs.

Within minutes after each test firing, the magnetic tape is "played back" through Brush Amplifiers and Oscillographs, which immediately provide chart records of data. These instruments permit visual examination of test results on the spot, speeding the work of engineers.

Versatile Brush Recording Instruments save testing time and simplify analysis in studies of stress, strain, force, torque, vibration and other mechanical or electrical variables. For help on *your* measurement problems call your nearby Brush representative, or write Brush Electronics Company, Dept. DD-7, 3405 Perkins Avenue, Cleveland 14, Ohio. In Canada: A. C. Wickman Ltd., Toronto.

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INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
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less weight per horsepower a problem, too?

There's an easy way to keep pace with the race for more engine horsepower . . . without adding weight per horsepower, without sacrificing valuable space. *Specify Miehle-Dexter Superchargers.* You'll register a big gain in horsepower—up to 50% or more—and the additional investment in equipment will be far less by comparison with other methods.

And when you put M-D Superchargers on your engines you're assured of efficient operation plus long life and low maintenance service. Exclusive M-D features make this possible. Result: dividends in fuel economy and maintenance costs.

On small jobs as well as large, M-D engineers will be glad to work with you—to help you get the exact size and type of supercharging equipment for your purpose. Write for technical brochure with specifications and performance data.

MIEHLE-DEXTER SUPERCHARGERS
are engineered to match your exact requirements

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MIEHLE-DEXTER SUPERCHARGER

HANSEN REPRESENTATIVES
Quick-Connective Couplings
Are Their Business
But So Are Fluid Line Problems

For the help you need—

When You Have Fluid Line Troubles

When Hook-ups Are Being Planned or Altered

CALL YOUR HANSEN REPRESENTATIVE

In thousands of plants it's almost routine procedure to call the Hansen representative—either when actual fluid line difficulties arise—or when circuits are being planned or altered.

From years of on-the-job experience with almost every type of fluid line installation, the Hansen man can tell you what works—and why it does. For the practical know-how that will give you a real lift over the rough spots, call your Hansen representative. You'll be glad you did.

K. C. MOSIER
K. C. Mosier Company, Dayton, Ohio
Provides engineering service on pneumatic and hydraulic installations to diversified interests including refrigeration, machine tooling and general manufacturing in the Southern Ohio area.

WM. A. URSEM
F. & W. Ursem Company, Cleveland, Ohio
Offers complete sales engineering service on pneumatic and hydraulic equipment in heavily concentrated industrial district of Northern Ohio. Was first representative to introduce Hansen products to industrial trade.

RALPH A. HILLER
Ralph A. Hiller Company, Pittsburgh, Pa.
Supplies engineering assistance in the application of fluid line equipment to practically all types of industry in Western Penns/lvania—including steel mills, fabricators, and foundries—and to producers of glass, ceramics, chemicals and heavy equipment.

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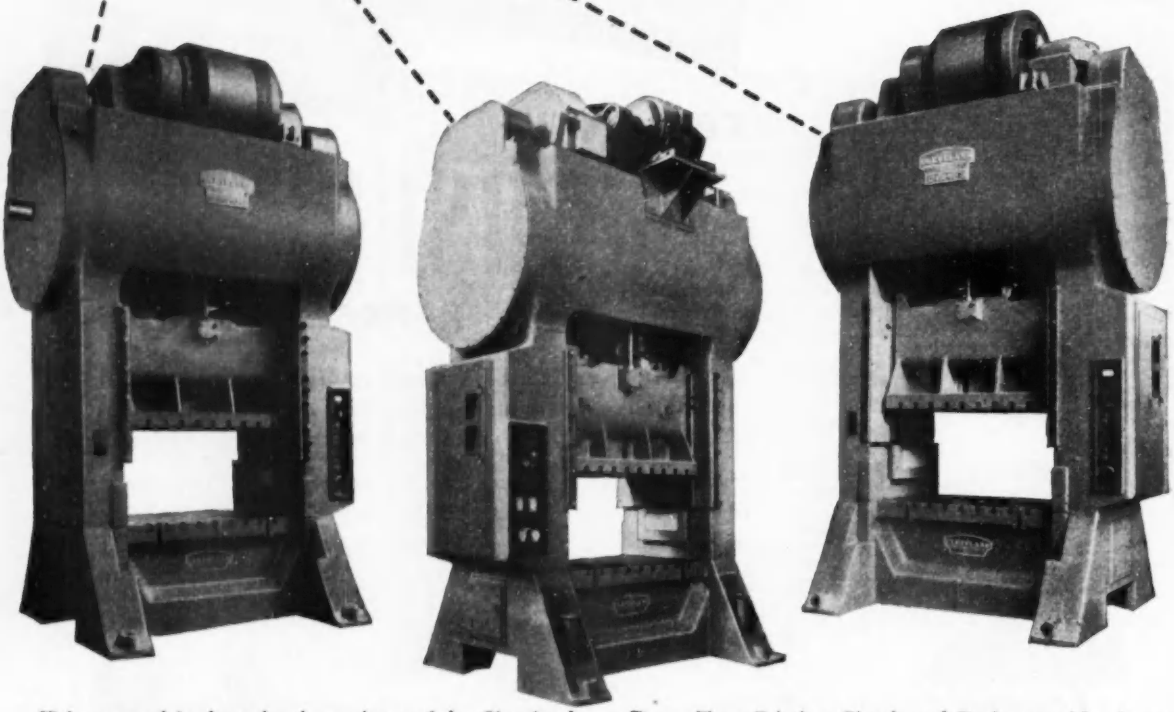

Take a good look at the three views of the Cleveland 350-ton, two-point press shown here. Check the many Cleveland design features for better operation. Most of these same features are available on all 11 types of Cleveland's complete line of presses. Study them and see why you'll profit by installing Clevelands.

RUGGEDNESS—This Cleveland features the four-piece tie-rod type of construction. The bed, crown and two uprights are securely held together by four steel tie-rods that have been heated to the correct degree and allowed to shrink into place. These rods not only hold the four sections rigidly together but take up the stress which otherwise would be transmitted directly to the frame as in one-piece type of press construction.

ACCURACY—Cleveland slides are fitted with extra long bearing surfaces. These insure accurate guidance throughout the entire slide stroke. For lasting accuracy the gibs can be adjusted to eliminate undue play between gibbing and slide-bearing surfaces.

ECONOMY—The trouble-free (patented) Cleveland Drum Type Friction Clutch and Brake provides instantaneous slide control at all times. This unit needs little maintenance and is readily accessible. Costly down-time due to clutch failure is practically eliminated. Lightweight construction and cool running design offer power savings.

SAFETY—The powerful, spring-loaded, clutch brake brings the slide to an immediate stop in event of electric or air supply failure. For added safety the flywheel is equipped with an auxiliary air brake which brings it to an immediate stop when power is shut down.

SPECIAL FEATURES—As shown here, this Cleveland is equipped with two safety blocks for use during die setting. These blocks are tied into the control circuit by safety plugs. When blocks are removed from their storage position in press base, the control circuit is made inoperative. For added convenience the die area is lighted from both sides by lights recessed in the uprights. Centralized lubrication not only assures better operation but greatly reduces maintenance-time.

A-9797

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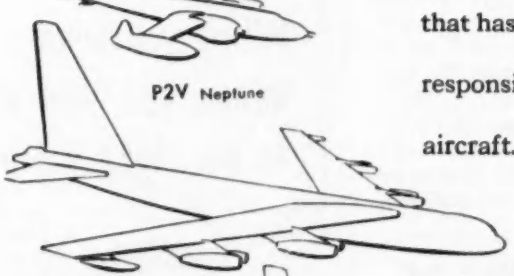
PLEBE
MILITARY TRAINER

F-84 Thunderstreak

F3H Demon

P2V Neptune



B-52 Stratofortress

B-47 Stratojet

F101 Voodoo

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the same know-how and experience
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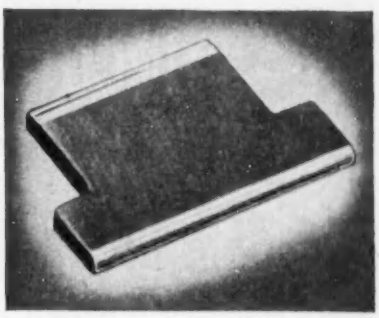
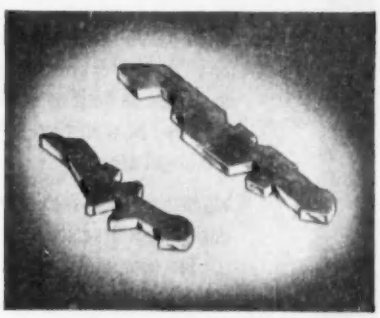
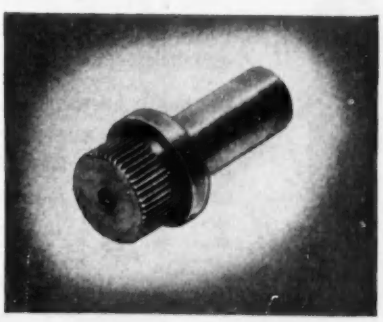


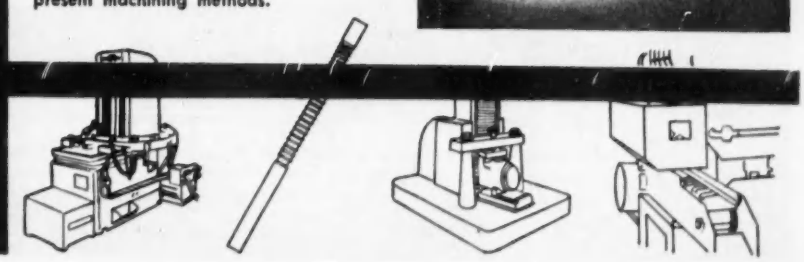
TEN TIMES FASTER than previous methods—broaching top and bottom radii on these automatic transmission reverse band anchors is helping one manufacturer lower the break-even costs. The design called for both edges to be rounded with a taper leading into one of the rounded edges. Besides increasing production by 10 times, the broached surfaces are more accurate, and costs are kept to a minimum. Thousands of these band anchors are being machined between broach sharpenings.



THIRTY TIMES FASTER than milling—broaching lowers costs in the production of the intricate shapes of these copper breaker points. Seven pieces at a time are broached at a rate 30 times faster than by milling. 75,000 pieces are completed before it is necessary to sharpen the broach. 800 to 1000 pieces per hour are broached on one Colonial machine with only two sets of Colonial broaches.



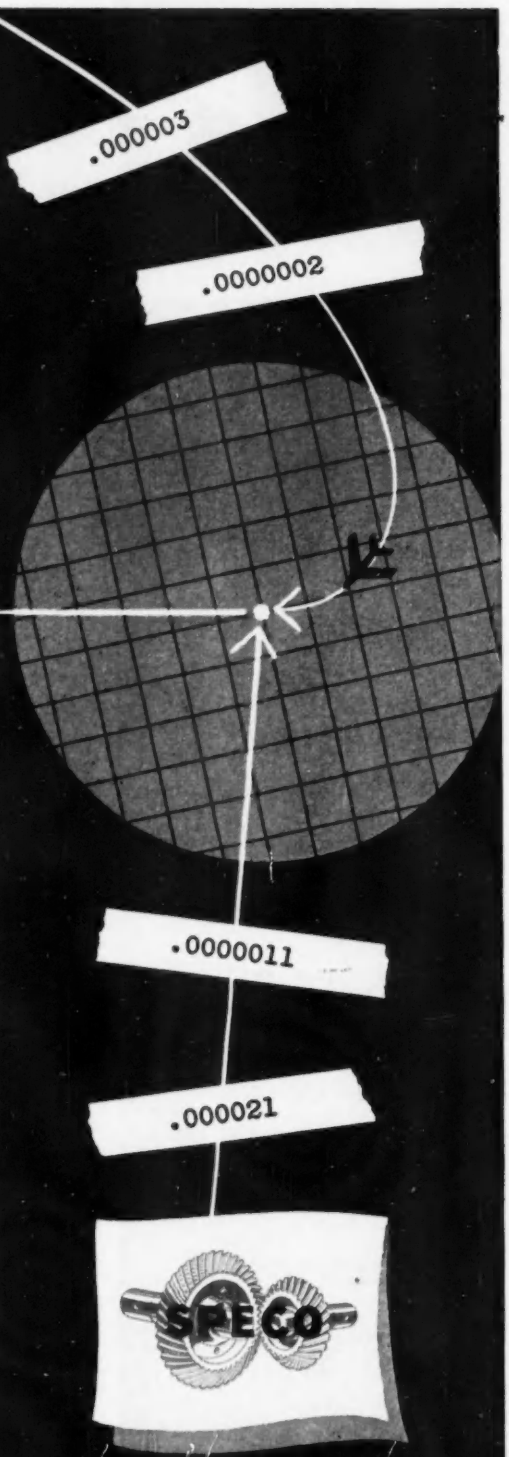
TWENTY TIMES FASTER than other methods—the serrations on the end of this shaft are cut with a button broach in a single pass. Cost per part is reduced substantially because broaching is 20 times faster. This, and hundreds of other applications on file at Colonial, are ample testimony of the tremendous cost-cutting potential that can be yours by utilizing "Unified Broaching" by Colonial. Send us prints of your parts—let us show you how to cut costs over your present machining methods.



COLONIAL

How many places

east of the decimal point?



● We haven't yet found this on a drawing but . . . on a bombing or computing gunsight, an almost infinitesimal decimal error in the device itself, may well be multiplied to hundreds of yards, at the target area.

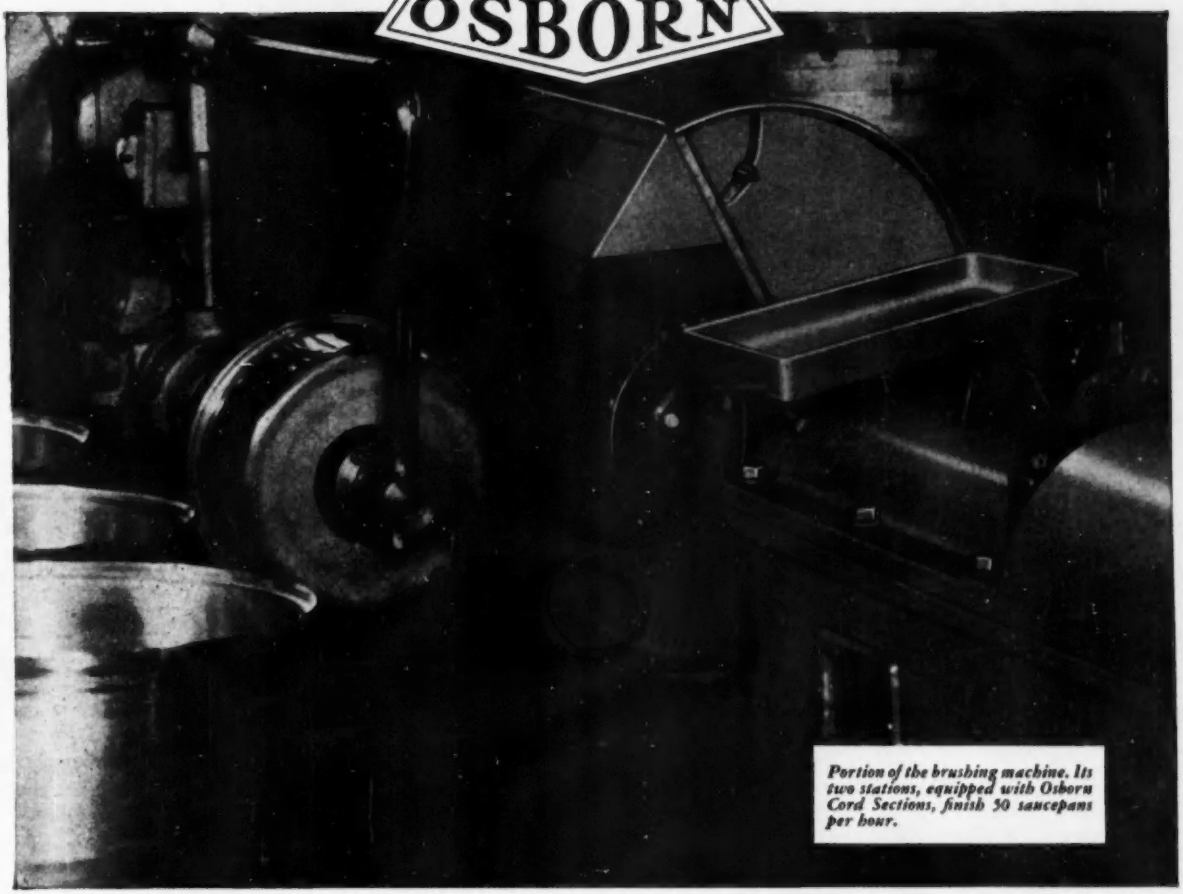
We help forestall such errors and results by producing gear assemblies of the utmost precision . . . for computers, for accessory drive units, actuators, transmissions and controls. We also produce precision components such as bomb hoists, gun turrets, radar tracking and scanning assemblies.

Bring us your development and production problems, large or small. Our long, proven experience can solve them. A letter or telephone call will put us at your service.

THE STEEL PRODUCTS ENGINEERING CO.

ENGINEERS AND MANUFACTURERS • SPRINGFIELD, OHIO

OSBORN



Portion of the brushing machine. Its two stations, equipped with Osborn Cord Sections, finish 50 saucepans per hour.

Recipe for cooking up a 33% saving

HERE'S how to make stainless steel shine in *two* steps where it formerly took *three:*

This manufacturer of stainless utensils used these operations: (1) Rubbing with 220 oiled grit. (2) Rubbing with 320 oiled grit. (3) Buffing. The Osborn Brushing Analyst suggested the use of Osborn Cord Sections with stainless steel cut and color compound instead of operations (2) and (3).

Results: The finish is perfectly uniform. Finishing time has been cut 33%.

This is typical of savings being made in finishing of many materials and many products with Osborn Push-Button Brushing methods. Find out how *you* can save. Call your nearby **OBA** or write *The Osborn Manufacturing Company, Dept. E-19, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN BRUSHING METHODS • POWER, MAINTENANCE AND PAINT BRUSHES • BRUSHING MACHINES • FOUNDRY MOLDING MACHINES

PRATT & WHITNEY 3

NUMBER

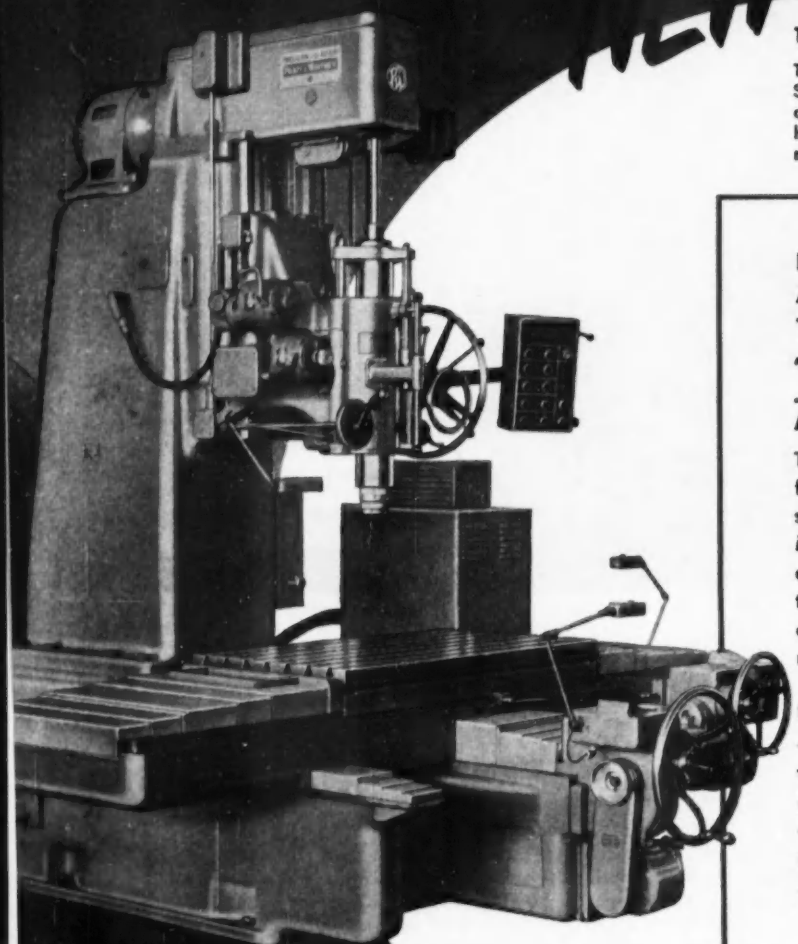


Table Working Surface: 28" x 56"

This latest addition to the Pratt & Whitney Electrolimit Series augments this famous Jig Borer Line. With ample capacity for all but the largest jobs, the Number 3E is a powerful machine that handles a wide range of work sizes with speed, ease and efficiency.

BRINGING YOU THESE IMPORTANT ADVANTAGES OF ALL P&W ELECTROLIMIT JIG BORERS . . .

"TENTHS" ACCURACY EASILY, POSITIVELY . . . *with the exclusive P&W Electrolimit Measuring System*

This method of locating the table is extremely fast, accurate and simple to use. Basic 1 inch spacings are obtained ***electromagnetically*** from solid master bars; there are no contacting surfaces; possibility of lost accuracy through wear is eliminated. Fractional inches are obtained by means of an easy-to-set, precision micrometer screw reading direct to .0001 inches.

PRECISION PRELOADED BALL ROLL QUILL . . . *Retains Initial High Precision Indefinitely*

The hardened, ground and lapped spindle "roll-feeds" in a preloaded ball roll mounting. "Tenths" accuracy is maintained indefinitely. Unlike plain bearing type quills, no maintenance or adjustment is required.

. . . for

tralized

MORE CONVENIENT HANDLING OF LARGE, IRREGULAR WORK PIECES . . . *with P&W Open Side Construction*

Provides far greater speed and ease in handling than is possible with two-column construction.

TELESCOPING GUARDS... protect carriage and bed ways.

OTHER PRATT & WHITNEY JIG BORERS

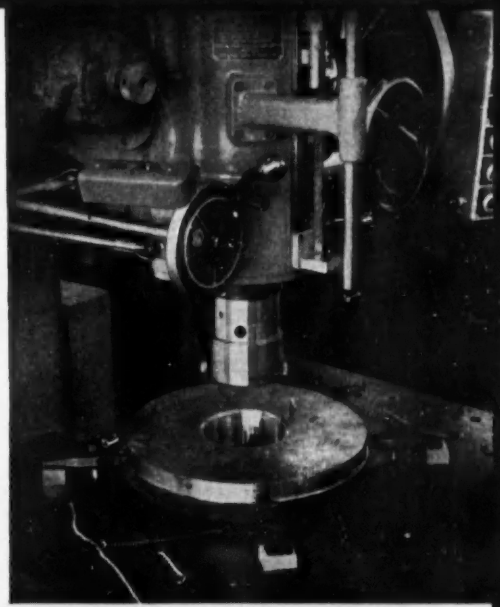
ELECTROLIMIT TYPES ..... Number 1E, 2E and 4E, with table sizes from 12" x 24" to 36" x 72".

END MEASURE TYPES ..... a complete line with table sizes from 12" x 24" to 24" x 54"

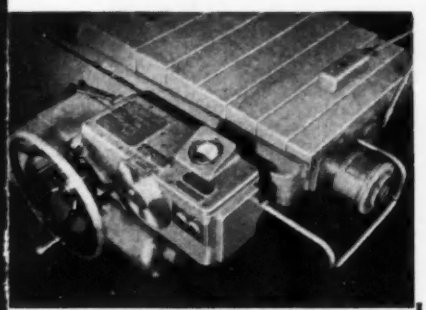
PRATT & WHITNEY announces the availability of a 28 minute, 16mm, sound, **COLOR FILM** on **JIG BORERS** **"ACCENT ON ACCURACY"** for group showings. Write on Company or Official Society letterhead for reservation.

E Electrolimit JIG BORER

COMBINING EXTREME ACCURACY WITH ADDED PRODUCTIVE EFFICIENCY



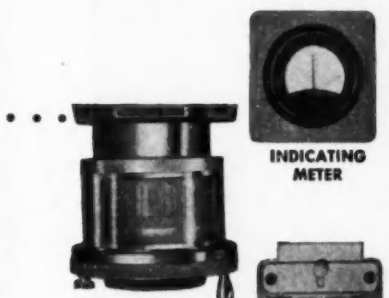
PLUS THESE OUTSTANDING NEW FEATURES FOR HEAVIER METAL REMOVAL...



ELECTROLIMIT MEASURING SYSTEM

THE P&W DOUBLE BIT BORING BAR

Specifically designed for fast, accurate production boring, the two carbide bits provide a "balanced cut" that enables the Number 3E to make use of its full horsepower for rapid metal removal when machining tough alloys. Up to 1/2" of metal can be removed per revolution, with each bit taking off 1/8". For maximum rigidity, the DOUBLE BIT BORING BAR ***screws directly*** onto the spindle nose.



INDICATING METER

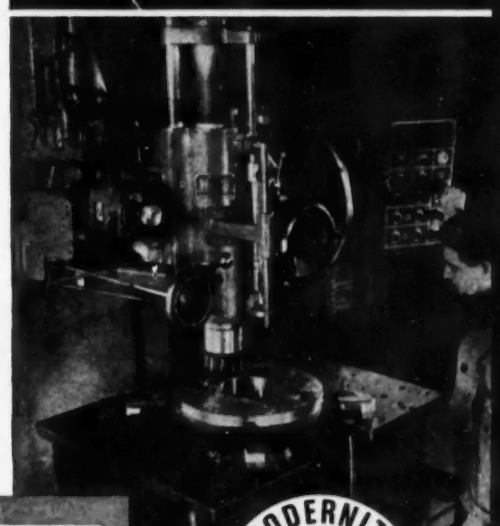
PRECISION MICROMETER

CIRCULAR REFERENCE SCALE

FOR *Added Versatility*

THE P&W MILLING ADAPTER

The ability of the P&W Ball Roll Quill to withstand lateral pressures without wear or deflection has made it practical to provide the 3E Jig Borer with electronically controlled milling feeds and to make available the new MILLING ADAPTER. Now you can make light, precision milling cuts with ease . . . and benefit from this extra utility of an already versatile machine. Like the Double Bit Boring Bar, the Milling Adapter screws directly onto the spindle nose for maximum rigidity.



SEND NOW FOR COMPLETE INFORMATION

. . . see how the advantages offered by the Number 3E

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MODERNIZE with PRATT & WHITNEY REPLACE FOR PROFIT

First Choice for Accuracy

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GREY IRON CASTINGS

ONE OF THE NATION'S
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PRODUCTION FOUNDRIES

ESTABLISHED 1866

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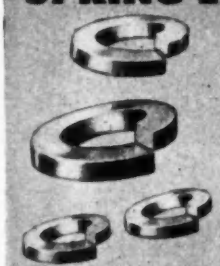
YOU CAN'T BEAT GARRETT for SMALL PARTS and SERVICES

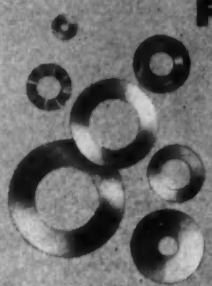
Whether they are small or medium size parts to regular specifications or special sizes and finishes . . . Garrett can give you quick deliveries. Garrett's stock of billions of parts make most deliveries possible from stock. Garrett's three modern plants equipped with the most up-to-date, precision automatic machines provide the fastest service on parts to your special specifications.

SPRING LOCK WASHERS



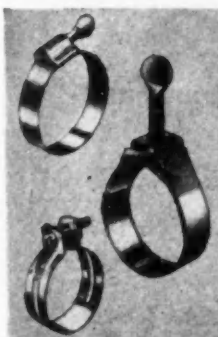
Complete line of high quality spring lock washers to ASA and SAE specifications, plus many special types . . . wide choice of metals plated to your requirements.

FLAT WASHERS



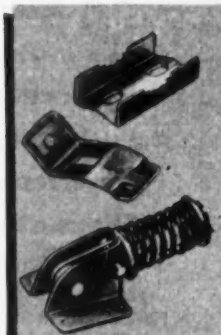
Fast delivery from the most complete line of washers in the world. Precision made in thousands of different sizes and types—all standard and many semi-standard sizes. Ready for delivery from stock to you.

HOSE CLAMPS



Aircraft AN 737 Stainless steel radial type. Multi-Clamp (QS100 & AN 748) worm type screw hose clamp. Auto-Seal, the inexpensive high quality hose clamp.

STAMPINGS



Quick deliveries on small and medium stampings made to your specifications on high-speed precision production presses. Finished, tumbled and plated to your specifications.

Write today for the Garrett catalog and technical data on these products.

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OF PHILADELPHIA

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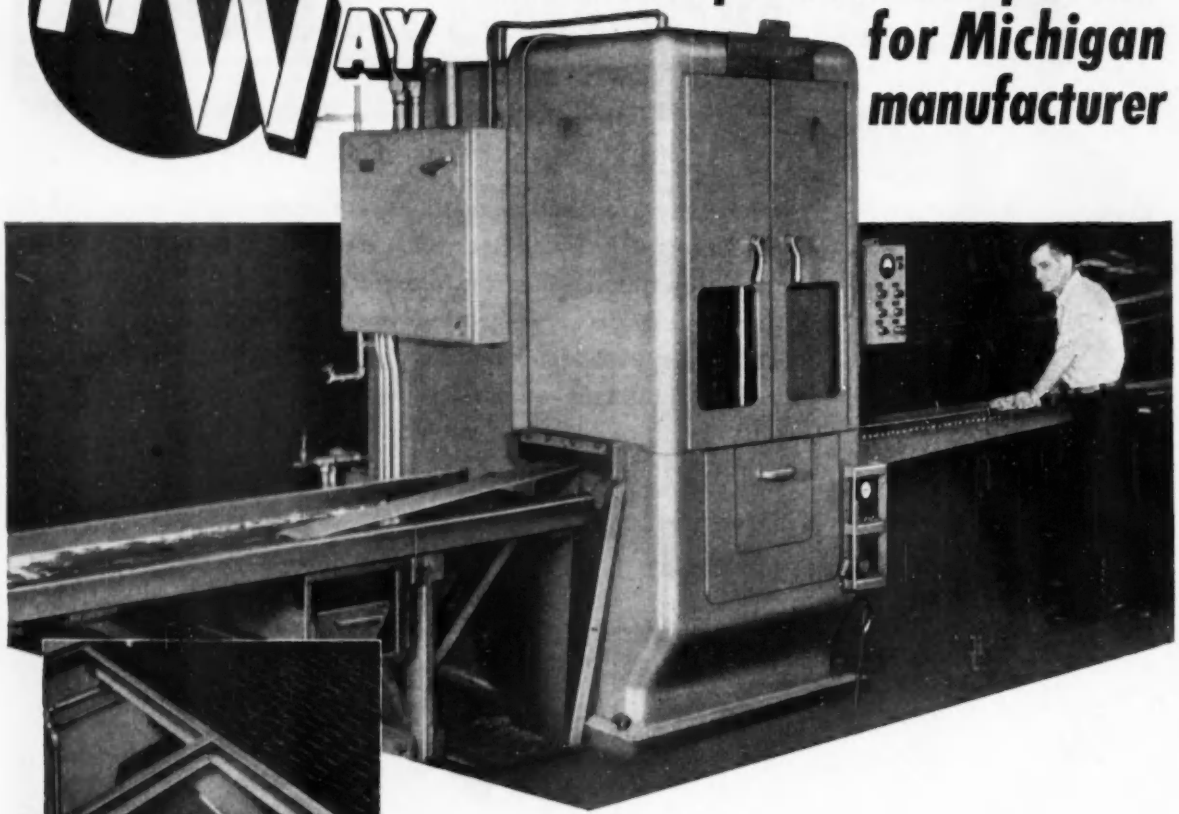
MURRAY WAY

MICRO-POLISH strip grinding boosts output over 600 percent for Michigan manufacturer



The New Murray-Way rotary filter which efficiently reclaims coolant on this operation. Permanent filtering media saves the cost of this equipment in a short time.

- ★ **Assures Product Uniformity**
- ★ **Cuts Material Loss and Scrap**
- ★ **Eliminates Down-time**
- ★ **Replaces Two Expensive Hand Operations**
- ★ **Facilitates Subsequent Operations**
- ★ **Improves Product Appearance**
- ★ **Eliminates Dust and Mess**
- ★ **Pays For Itself**

Here's one more illustration of Murray-Way's ability to do the job better, faster, and more economically.

Murray-Way's Automatic Equipment, thorough experience and expert engineering can save YOU money on YOUR polishing, buffing, grinding or filtering operations. Why not give us a call . . . JOrdan 4-6890 Detroit, or write for our complete, illustrated Micro-Polish Brochure.

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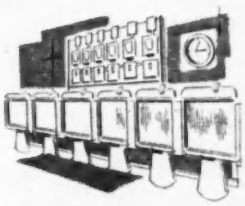
P. O. BOX 180, MAPLE ROAD EAST · BIRMINGHAM, MICH.

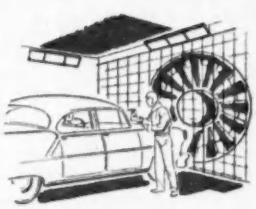
Polishing, Buffing, Grinding, Filtering Equipment that automatically cuts your costs.

HARRISON'S RUNNING A TEMPERATURE . . .

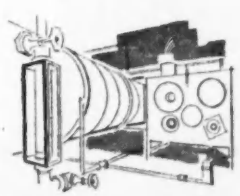
to keep You comfortable!



Testing 6 Harrison radiators in rigorous "life-cycle" test.



Testing a Harrison heater at sub-zero in the cold tunnel.



Testing radiator performance on huge dissipator machines.

The heat's on . . . at Harrison! 100 degrees in the hot tunnel and there isn't any shade! Wind velocity up to 100 miles per hour! Here in this modern inferno, we test the performance of Harrison radiators and air conditioning systems. Hour after hour, scorching air blasts the front of the car. Actually, it's like driving across the desert in the teeth of a high, hot, August wind! Tests like this prove beyond doubt that Harrison radiators and air conditioners are designed to stand up under *every* kind of driving condition. If you have a cooling problem, look to Harrison for the answer.

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N. Y.

HARRISON

TEMPERATURES MADE TO ORDER

EVERY CRACK has a cause!

It Costs You Less to Find the Cause than Scrap the Parts

Every crack has a cause. Find the cause when cracks *first* occur and you can eliminate the cause of rejects, and the wasted machine time and labor that push up costs when defects go to final inspection undetected. By concentrating production capacity only on *good* parts, you can produce the largest number of acceptable products at lowest cost per piece.

The causes of cracks are many and varied. Magnaflux *finds* the crack and outlines it with a clear mark right on the part itself, showing location and complete extent. Seeing this, and with experience, the cause is traceable. A few case studies below show how leading manufacturers are using "Correctioneering" by Magnaflux* nondestructive inspection methods to control processes — to prevent cracks and scrapping — *to save money.*

BETTER CAST IRON HANDLING *saved manufacturer-owned foundry $60,000 the first year they used sampling inspection with $2,400 Magnaflux unit. Cracked parts had been running 5%. Magnaflux showed the cause to be improper handling of parts after shakeout, which was corrected.*

CORRECTS HEAT TREAT CONTROL — ENDS CRACKED PARTS—*Company making drills and hand power tools uses Magnaflux along with hardness test in setting up every new job on induction heat treat. Samples are run, with changes of time and temperature for heating and water quench, until process is hardening properly without cracking parts. Then volume runs of good parts are begun.*

RECEIVING INSPECTION — REDUCES FORGINGS COSTS — *Large plant uses automatic Magnaflux unit for 100% receiving inspection of rough forgings. Suppliers are evaluated as to their price for good parts. Average rejects are 1%. However, some cheaper suppliers running 2% rejects actually average the lowest prices for parts accepted after inspection.*

LENGTHENS HAMMER RUNS—*At many forge plants, regular "hot" sampling inspection is made with Magnaflux during set-up of the hammer. Run is begun only when it is determined that dies and process will make good forgings. During run, periodic sampling tells if defects start to occur. Runs are continued as long as good parts are made. Longer runs and reduced set-up time result.*

CONTROLS COLD HEADING — GETS MORE USABLE PARTS — *Magnaflux is used to (1) inspect "wire ends" to assess gross quality of wire rolls and (2) for sampling inspection of upset parts at the cold heading machine. Seamy stock or worn dies are quickly caught before thousands of defective parts are produced.*

IMPROVES CASTING DESIGN — REDUCES REJECTS — *At many foundries, inspection with Magnaflux is used whenever a high percent of cracks are found in any run or in pilot runs. Run is stopped and casting technique is varied, using Magnaflux on each test pour to see if cause of defect is eliminated. Run is resumed when cause has been corrected and cracks avoided.*

PRODUCES BETTER, MORE DURABLE TOOLS—AT LOWER COST—*Tool makers now produce more uncracked tools, with resulting lower costs, by using Magnaflux or Zyglo* for both rough state and final inspection to evaluate cracks and correct causes. Tool users inspect new tools and reworked tools. Uncracked tools insure longer runs for each machine set-up.*

GETS LONGER MACHINING RUNS — SAVES TOOLS — *Manufacturer of small, low-cost gray iron pistons found that cracks in the pistons were causing expensive breakage of carbide tipped tools. One hundred percent inspection with Magnaflux-Magnaglo has removed this hazard and reduced overall costs.*

IMPROVES GRINDING CONTROL AND TECHNIQUE — *Improper wheel speed, hardness, cleanliness, coolants or faulty grinding techniques are quickly spotted and eliminated through sampling inspection of output with Magnaflux-Magnaglo*. Also, when high residual stresses or poor stress relief cause grinding trouble, Magnaglo and hardness test combine to pinpoint necessary correction of stress relief practices.*

Ask to have a Magnaflux engineer investigate with you, how "Correctioneering" by Magnaflux may save you money. Or, write for our free booklet "Finding the 'How and Where' of Lower Production Costs"

*Magnaflux, Magnaglo and Zyglo are registered trade marks of the Magnaflux Corporation.

MAGNAFLUX CORPORATION

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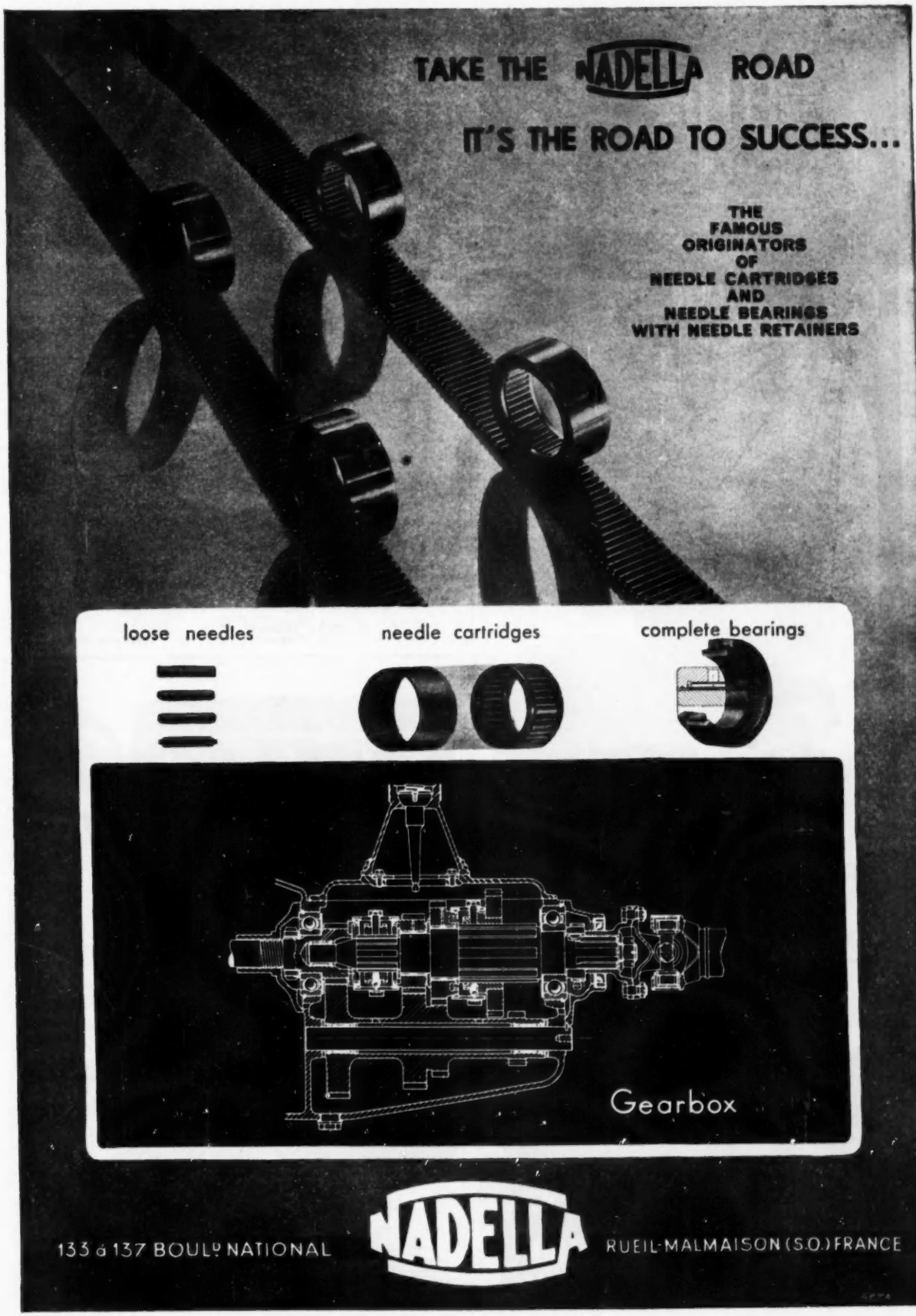
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IT'S THE ROAD TO SUCCESS...
THE FAMOUS ORIGINATORS OF NEEDLE CARTRIDGES AND NEEDLE BEARINGS WITH NEEDLE RETAINERS
loose needles
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COLD HEADED PRODUCTS

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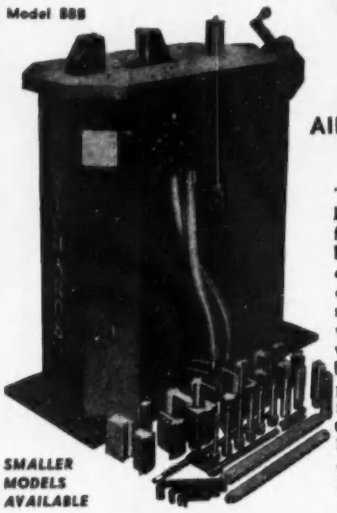
1914 BROADWAY • ROCKFORD, ILLINOIS

Multiform

BIG BROTHER BENDER

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

Model 888



SMALLER MODELS AVAILABLE

AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

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Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

in inch grams
...inch ounces
...inch pounds
...foot pounds

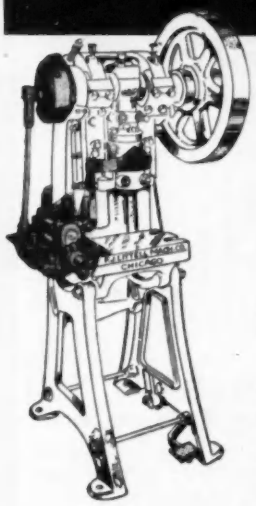
Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO
ADDISON QUALITY ILLINOIS

Automation in Action . . .

LITTELL Style "M" ROLL FEED

Makes Any Punch Press Fully Automatic—
and 3 Ways Better



● **FASTER** . . . 9,000 stampings an hour at 200 strokes per minute, or 4500 stampings an hour at 100 strokes per minute are easy production rates on any press with Style "M" Roll Feed.

● **SAFER** . . . Automatic feeding with Style "M" Roll Feed keeps hands and fingers safe from costly accidents.

● **LOWER IN COST** . . . Faster, automatic production from low cost coil stock cuts cost per stamping. Greater safety gives your presses the lowest insurance rate.

The Style "M" Roll Feed is quickly and easily installed on any standard punch press. Several models are available—the largest feeds coil stock up to 8" wide and .055" thick. All models feed left to right, right to left or front to back. Feed direction is reversed by reversing the clutch. On large models, feed length per stroke is from 0 to 4⅜" with standard gears, and from 0 to 8½" with compound gears. Feeding rolls are hardened and ground for long service life. Style "M" puts automation in your press room at lowest possible cost.

Write for the Littell Roll Feed Catalog

F. J. LITTELL MACHINE CO.
Speed with Safety

ROLL FEEDS • DIAL FEEDS
STRAIGHTENING MACHINES
REELS • AIR BLAST VALVES
District Offices: Detroit, Cleveland

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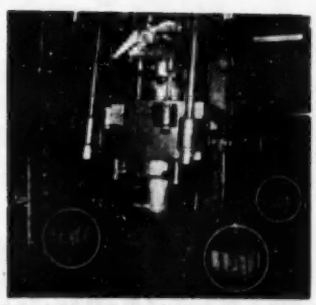
STOP VIBRATION AND

- Install Presses *Anywhere*
- Improve Plant Layout
- Reduce Dynamic Floor Loads
- Eliminate Special Foundations
- Increase Press Speeds & Production
- Reduce Maintenance
- Reduce Noise, Operator Fatigue
- Increase Press & Building Life



Korfund Vibro-Isolators solved a serious vibration problem, and permitted installation of this 100 ton press on a weak upper floor in a loft building. Isolators often permit higher press speeds for greater production.

Korfund installations range from the smallest up to 2,000 ton presses. Write today for complete information. If you give the press make, type, and model number and type of floor, we'll submit specific recommendations, without obligation. A half century of experience is at your disposal.

THE KORFUND COMPANY, INC.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

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prevents vapor lock!

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ELMIRA, N. Y.

Bendix* Electric Fuel Pump

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YOU can save money with

Vacuum

Vacuum testing for leaks has been proved the fastest, cleanest, most accurate method by leading automobile manufacturers. Testing by vacuum can be fully automatic . . . three times faster than other methods. Submersion is unnecessary, costly clean-up time eliminated. Let a Whittington engineer show you how vacuum can save *you* time and money.

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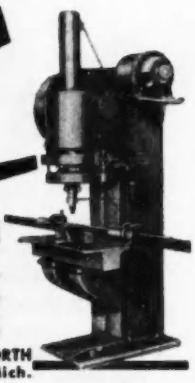

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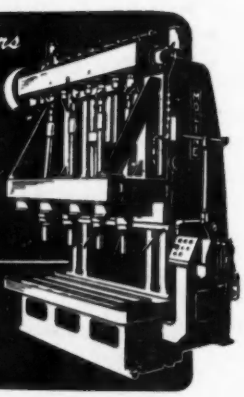

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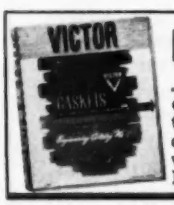

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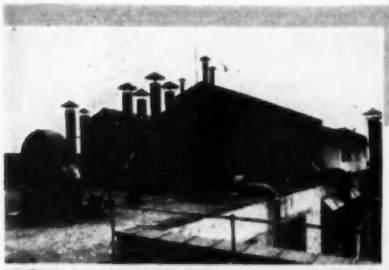

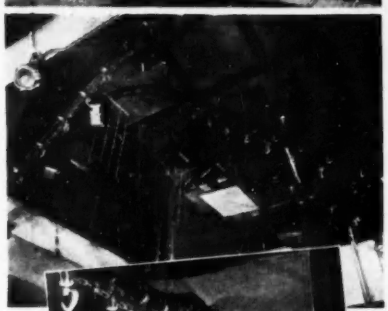

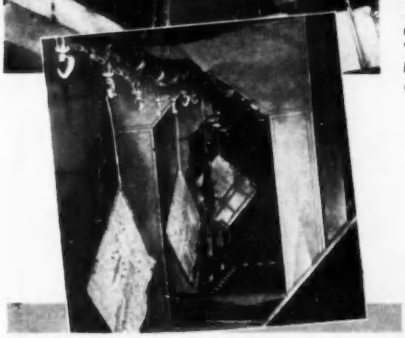

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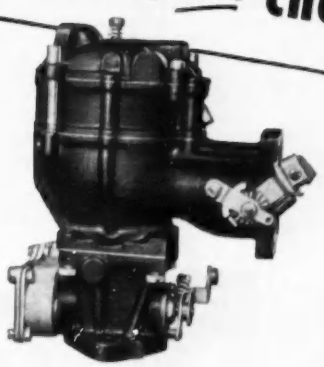

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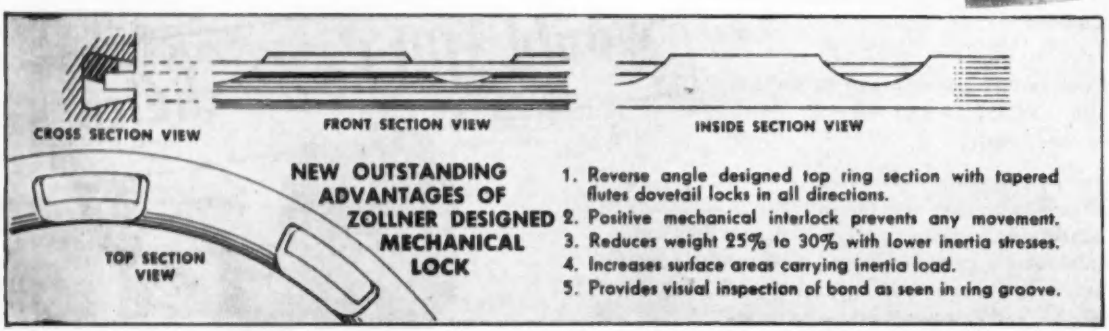

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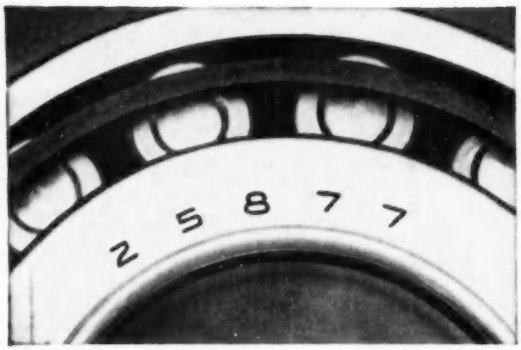

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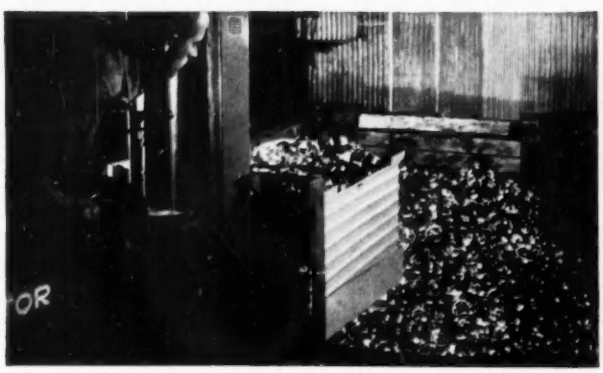

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